
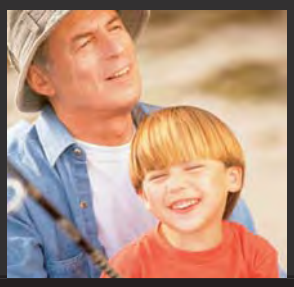

Missouri Diabetes Burden Report and State Plan

May 2009

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Missouri Diabetes Burden Report and State Plan

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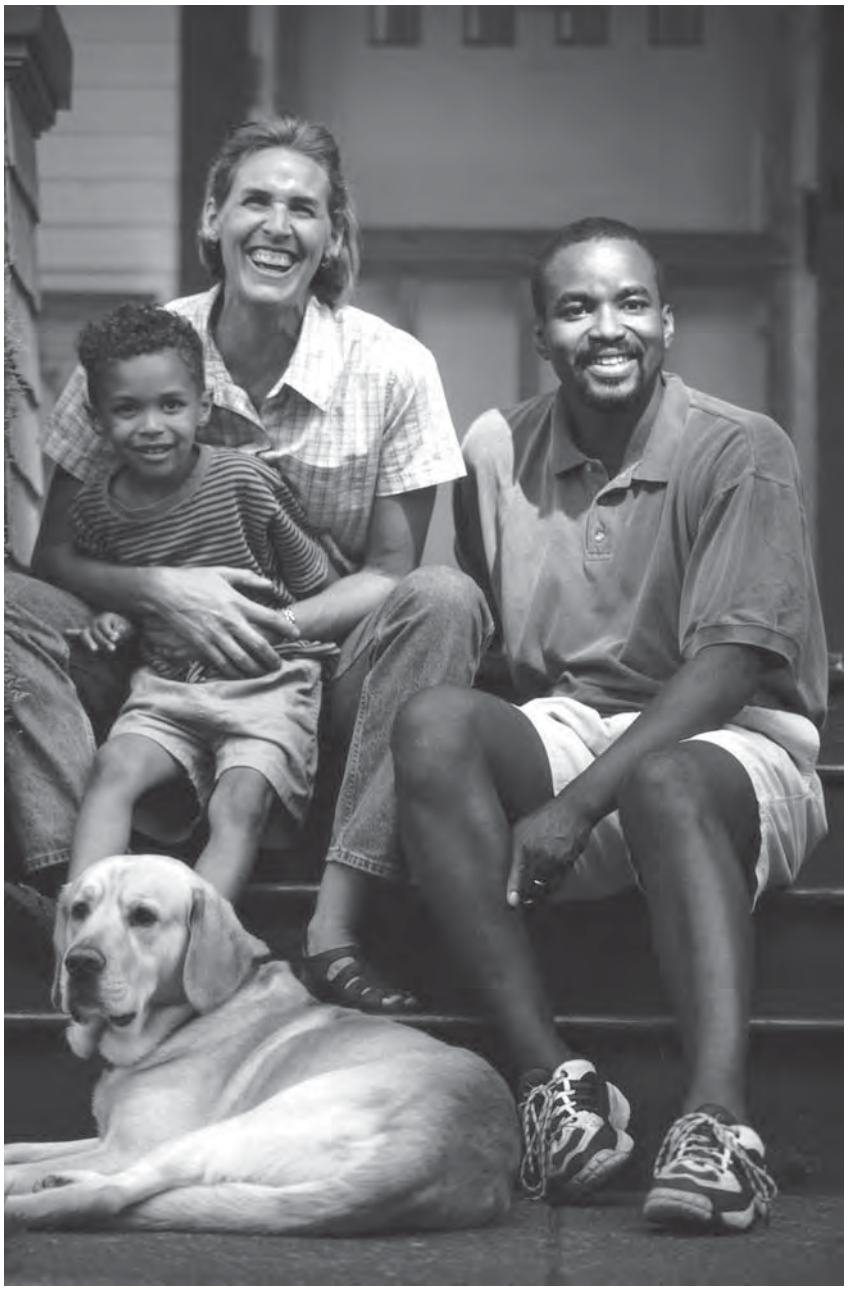
INTRODUCTION



Purpose of the Report

Preventing and treating diabetes and its associated health problems are important public health goals. To effectively address the problem, it is essential to fully understand the disease. This report provides detailed information about diabetes in Missouri for the purpose of policy-making and program decision-making. It also outlines approaches to address the continuum of the prevention of pre-diabetes, early detection and improved treatment of pre-diabetes and diabetes, and the prevention of complications for those with diabetes.

This report addresses the following issues regarding diabetes:

- What are the risk factors for diabetes?
- How are diabetes and pre-diabetes defined?
- What are the health consequences for this disease?
- How many Missourians are affected by diabetes?
- What is the economic impact on the state?
- What are the goals, strategies and actions needed to be effective?

STAGES OF DIABETES DISEASE

Diabetes is a chronic, progressive disease. Once diagnosed with diabetes, patients must live with it for the rest of their lives. Despite the seriousness and costliness of diabetes, it can be controlled. If the disease is uncontrolled and unmanaged, the progression is more rapid with more devastating complications and premature death.

To understand the cause and consequences of the disease, the following visual model is helpful.

Healthy →Risk Factors →Pre-Diabetes →Diabetes →Complications →Death

Healthy →Risk Factors →Pre-Diabetes →Diabetes →Complications →Death

Being healthy is a condition where an individual is free of disease. On a broader scale, health is also fostered when social and environmental conditions promote physical and mental well-being.

Healthy → Risk Factors →Pre-Diabetes →Diabetes →Complications →Death

A person moves from healthy to at risk when one or more factors that increase the risk for developing a disease become present. Factors that increase the risk for developing pre-diabetes and type 2 diabetes include:

- Age >45 years
- Overweight (body mass index [BMI] ≥25.0 kg/m^2) or obese (BMI ≥30.0 kg/m^2)
- Smoking
- Race/ethnicity (African-American, Hispanic/Latino, American Indian, and Asian/Pacific Islanders)
- Family history of diabetes in one or more first-degree relatives (father, mother, sister or brother)
- Physical inactivity (<30 minutes of moderate activity five or more days/week or <20 minutes of vigorous activity three or more days/week)
- For women, a previous history of gestational diabetes or delivery of a baby weighing more than nine pounds
- History of hypertension (≥140/90)
- History of dyslipidemia (high-density lipoprotein [HDL] <35 mg/dL [0.90 mmol/L] and/or triglyceride level >250 mg/dL [2.82 mmol/L])
- History of pre-diabetes (formerly known as impaired glucose tolerance [IGT] or impaired fasting glucose [IFG])
- Signs of insulin resistance (acanthosis nigricans)
- Polycystic ovary syndrome (PCOS)

Four behaviors that are risk factors for type 2 diabetes can be modified through lifestyle changes: 1) being overweight, 2) being obese, 3) being physically inactive and 4) smoking.

Healthy →Risk Factors → **Pre-Diabetes** →Diabetes →Complications →Death

Pre-diabetes exists when blood glucose levels are higher than normal, but not high enough to be diagnosed as diabetes. Pre-diabetes (also known as IGT or IFG) increases the risk for developing type 2 diabetes, heart disease and stroke. With healthy lifestyle changes, people with pre-diabetes can bring blood sugar levels back into the normal range, delaying the onset of diabetes or even preventing diabetes.

Pre-diabetes is defined as:

- IGT: Oral Glucose Tolerance Test (OGTT) 2 hours postload glucose 140-199 mg/dL
- IFG: Fasting Blood Glucose 100-125 mg/dL

SCREENING AND PREVENTION

In 2005, the Diabetes Screening Guidelines Work Group – which represented provider groups, managed care, MO HealthNet, public health, free clinics and others – developed the Missouri Consensus Screening Guidelines for Pre-diabetes and Diabetes in a Medical Setting. The Missouri screening guidelines are available at www.dhss.mo.gov/diabetes/Guidelines.

Diabetes Disease Background

Healthy →Risk Factors →Pre-Diabetes → **Diabetes** →Complications →Death

Carbohydrates in the foods we eat change into glucose, also known as blood sugar. The body uses glucose for energy. Insulin is a hormone produced by the pancreas that enables glucose to enter the cells of the body. When an individual has diabetes, the body either does not produce enough insulin or cannot use the insulin it produces effectively, causing glucose to build up in the blood. Diabetes is diagnosed when two consecutive fasting plasma glucose blood tests measure 126 mg/dL or higher.

TYPES OF DIABETES

There are three major types of diabetes. They are type 1, type 2, and gestational diabetes. Other types of diabetes may result from specific genetic conditions, surgery, drugs and other illnesses.

Type 1 Diabetes

With type 1 diabetes, the body develops high blood glucose levels due to a total lack of insulin. The body's immune system attacks the insulin-producing beta cells in the pancreas and destroys them. The pancreas then produces little or no insulin, requiring the individual to take insulin injections to stay alive. Type 1 diabetes develops most often in young people but can appear in adults. Approximately, five to ten percent of all diagnosed cases of diabetes are type 1.[1] The cause of type 1 diabetes is generally unknown but may involve genetic, autoimmune or environmental factors. Research has not identified interventions that can be widely implemented to prevent type 1 diabetes and its cause, beta cell failure in the pancreas. Given this, the discussion of diabetes prevention in this document relates only to the prevention of type 2 diabetes.

Type 2 Diabetes

Type 2 diabetes occurs when the body does not produce enough insulin or cannot utilize insulin properly. Type 2 diabetes accounts for 90 percent to 95 percent of all diagnosed cases of diabetes and develops most often in middle-aged and older adults but can appear in young people. Other risk factors for type 2 diabetes include a family history of diabetes, obesity, physical inactivity, prior history of gestational diabetes, pre-diabetes and race/ethnicity. African-Americans, Hispanic/Latino American, American Indians and some Asian Americans and Pacific Islanders are at higher risk for type 2 diabetes compared to white, non-Hispanics.

Gestational Diabetes

Gestational diabetes occurs when a woman who has never had diabetes before pregnancy exhibits increased blood glucose levels during pregnancy.[2] It is caused by either hormones of pregnancy or a shortage of insulin. It typically develops in 2 percent to 5 percent of all pregnancies but usually disappears when a pregnancy is over. Women who have had gestational diabetes have a 20 percent to 50 percent chance of developing diabetes five to ten years postpartum.[1]

Untreated or poorly controlled gestational diabetes can affect the baby. When a pregnant woman has gestational diabetes, her pancreas works overtime to produce insulin. Although insulin does not cross the placenta, glucose and other nutrients do—giving the baby high blood glucose levels. This

causes the baby's pancreas to make extra insulin, which can lead to macrosomia, or a large baby. Babies with macrosomia face health problems of their own, including damage to their shoulders during birth. Newborns producing extra insulin can have very low blood glucose levels at birth and are then at a higher risk for breathing problems. Babies with excess insulin become children who are at risk for obesity and adults who are at risk for type 2 diabetes.[2]

Other

Other specific types of diabetes result from specified genetic syndromes, surgery, drugs, infections and other illnesses and account for a small percentage of diagnosed cases of diabetes. Such types of diabetes may account for 1 percent to 5 percent of all diagnosed cases.[1]

SIGNS AND SYMPTOMS

Although there are similar signs and symptoms for type 1 and type 2 diabetes, they do differ. The common signs and symptoms for type 1 diabetes include:

- Extreme thirst
- Frequent urination
- Weight loss despite increased appetite
- Nausea
- Vomiting
- Abdominal pain
- Fatigue
- Absence of menstruation[3]

Many people with type 2 diabetes have no symptoms. If symptoms are present, common ones include:

- Increased thirst
- Increased urination, especially at night
- Increased hunger
- Fatigue
- Blurred vision
- Sores that do not heal
- Weight loss
- Dry, itchy skin[4]

Healthy →Risk Factors →Pre-Diabetes →Diabetes → **Complications** →Death

Undiagnosed or uncontrolled diabetes can lead to debilitating and costly health complications such as heart disease, stroke, blindness, amputation and kidney failure. Women who develop diabetes during pregnancy are at increased risk for complications such as stillbirths and deliveries by Caesarean section. Their babies may have congenital malformations.[5] Fortunately, the majority of complications can be reduced in severity, delayed, or even prevented by keeping blood glucose levels under control, eating healthy, being physically active, working with a health care provider to keep blood pressure and cholesterol under control, and getting necessary screening tests and immunizations.[6]

SCREENING TESTS

Several screenings/tests are recommended to aid in controlling diabetes and delaying the onset of complications or reducing the severity. The tests include:

- blood pressure and cholesterol monitoring
- microalbuminuria screening
- dilated eye examination
- glycated hemoglobin test (A1C)
- comprehensive foot examination
- self-glucose monitoring
- dental examination
- self-foot examination

The frequency of these practices varies based on many factors, including the number of complications present, number of risk factors present, duration of the disease, etc.

IMMUNIZATIONS

According to the American Diabetes Association Standards in Medical Care, individuals with diabetes over the age of 6 months should receive an annual influenza vaccine. In addition, adults with diabetes should receive at least one pneumococcal vaccine in their lifetime. A one-time pneumococcal revaccination is recommended for individuals over 64 years of age who were previously immunized when they were less than 65 years of age if the vaccine was administered more than 5 years ago. Other indications for repeat vaccination include nephrotic syndrome, chronic renal disease, and other immunocompromised states, such as after receiving an organ transplant.

Healthy →Risk Factors →Pre-Diabetes →Diabetes →Complications → **Death**

Mortality rates among persons with type 1 diabetes are high. For childhood-onset cases, data suggest that >15 percent will die by age 40, at which time the annual mortality rate will be 20 times that seen in the general population. In the period after diagnosis, acute coma is the leading cause of death, while later renal disease predominates. After 30 years with the disease, two-thirds of deaths result from cardiovascular disease.[7]

The four leading causes of death in persons with type 2 diabetes are heart/cardiovascular disease, diabetes, malignant neoplasms, and cerebrovascular disease. "Among middle-aged populations, life expectancy is reduced by 5-10 years. Reduction in life expectancy is greater for women than men and for those with complications, and decreases with increasing age at diagnosis."[8]

DIABETES BURDEN IN MISSOURI

Healthy → Risk Factors →Pre-Diabetes →Diabetes →Complications →Death

Through lifestyle modifications, individuals can alter some of the risk factors for diabetes. Four behaviors that are risk factors for diabetes can be modified through lifestyle changes: 1) being overweight, 2) being obese, 3) being physically inactive and 4) smoking.

From 1990 to 2007, there was an increasing trend in the prevalence of obesity and a decreasing trend in the level of physical inactivity among Missouri adults. The prevalence of being overweight remained fairly stable. More than twice as many adults reported being obese in 2007 than in 1990 (Fig. 1).[9] In 1990, one in three Missouri adults reported no leisure time physical activity compared to one in four in 2002 and later (Fig. 2).

Figure 1. Trend of prevalence (%) of obesity and overweight among adults, Missouri, 1990-2007 (Behavioral Risk Factor Surveillance System [BRFSS]).

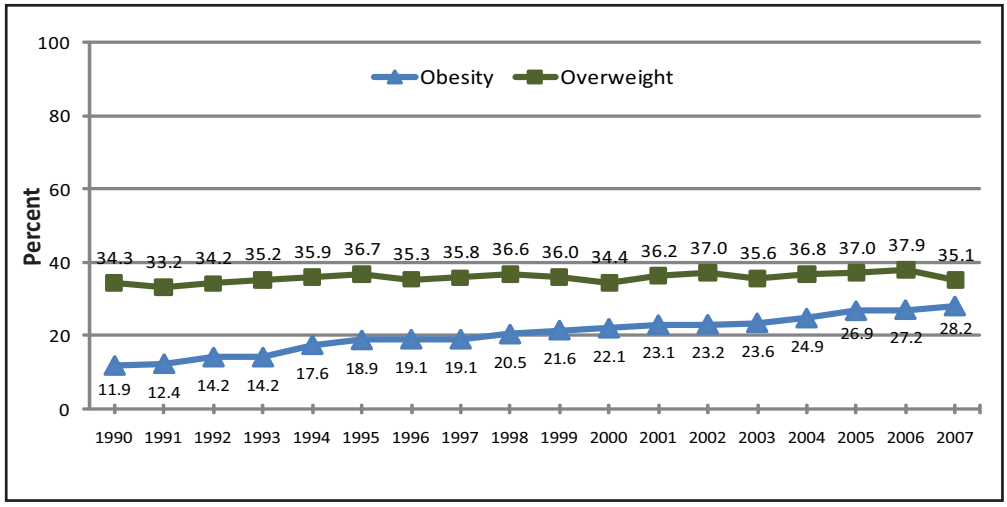
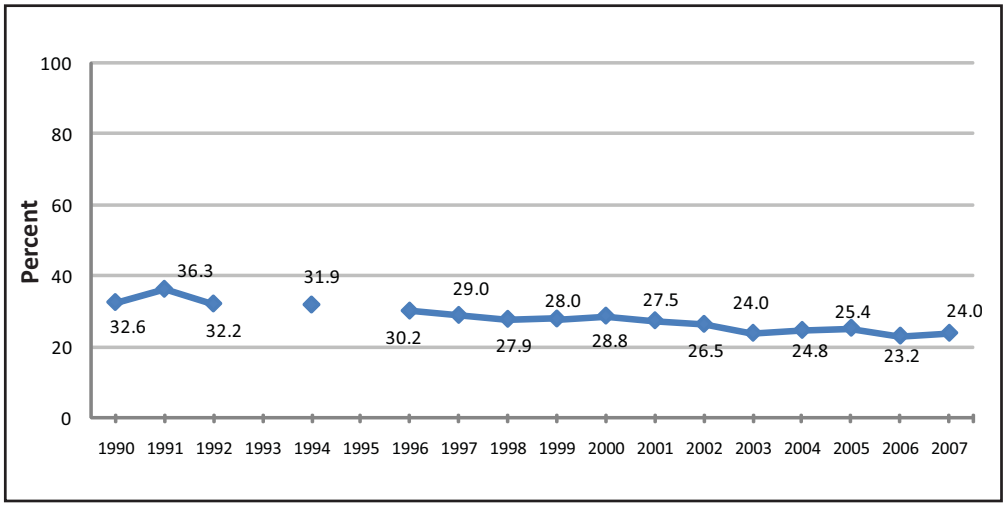


Figure 2. Prevalence (%) of no leisure time physical activity, Missouri, 1990-2007 (BRFSS).*



*Data not available in 1993 and 1995.

Healthy → Risk Factors →Pre-Diabetes →Diabetes →Complications →Death

In 2004, three out of five Missouri adults who self-reported no physician-diagnosed diabetes reported being overweight or obese (Fig. 3). Fortunately, among the same population, only one-fourth self-reported having no leisure time physical activity (Fig. 4).

Figure 3. Trend of prevalence (%) by weight category among adults without diabetes, Missouri, 2000-2007 (BRFSS).

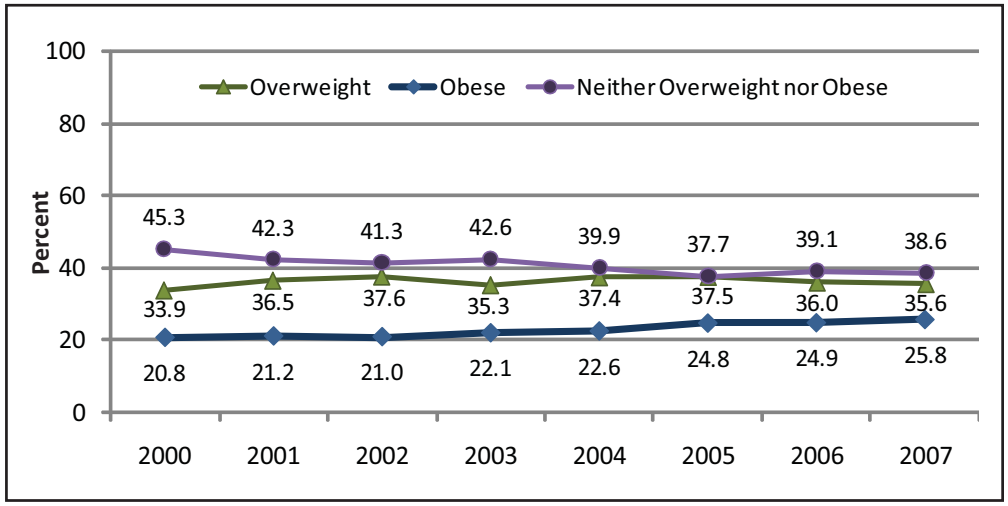
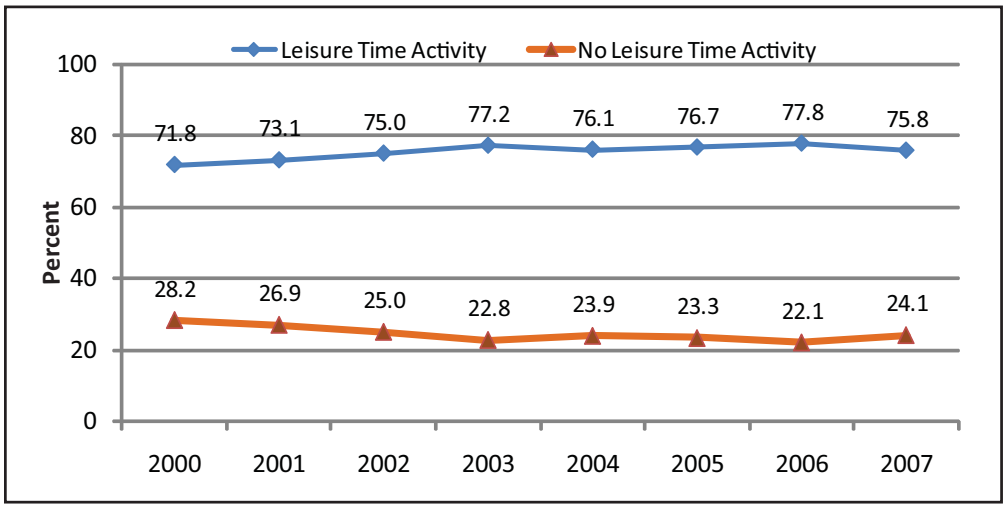


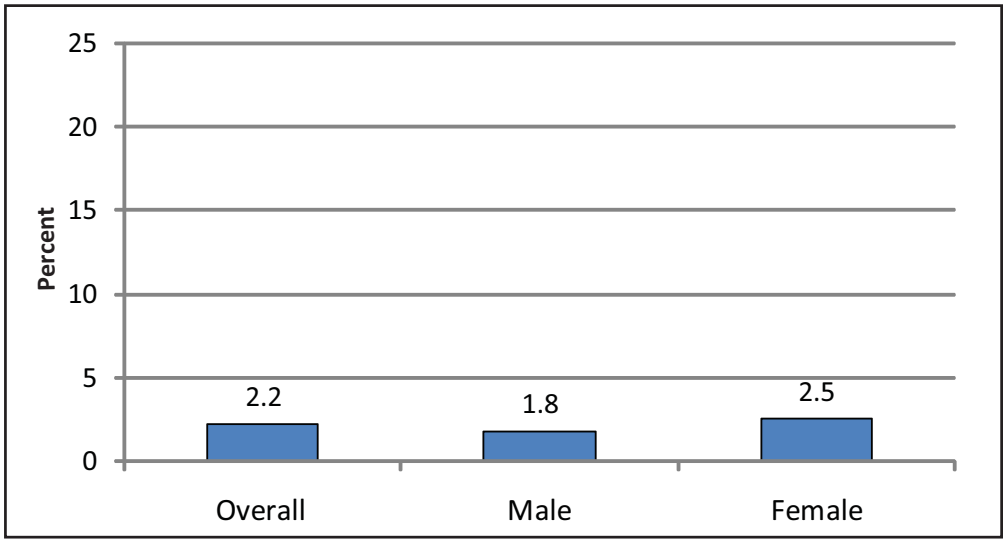
Figure 4. Trend of prevalence (%) of self-reporting leisure time physical activity in the last 30 days among adults without diabetes, Missouri, 2000-2007 (BRFSS).



Healthy →Risk Factors → **Pre-Diabetes** →Diabetes →Complications →Death

In 2007, 2.2 percent of Missourians self-reported that a physician told them they had pre-diabetes or borderline diabetes (Fig. 5). Pre-diabetes does not need to lead to diabetes; studies have shown that development of type 2 diabetes has been reduced among high-risk individuals by 58 percent over three years through lifestyle interventions (i.e., losing weight and increasing physical activity).[10] According to the Centers for Disease Control and Prevention (CDC), Missouri is one of five states with the highest number of reported cases of pre-diabetes in the nation.[9]

Figure 5. Prevalence (%) of self-reported physician-diagnosed pre-diabetes among adults, Missouri, 2007 (BRFSS).



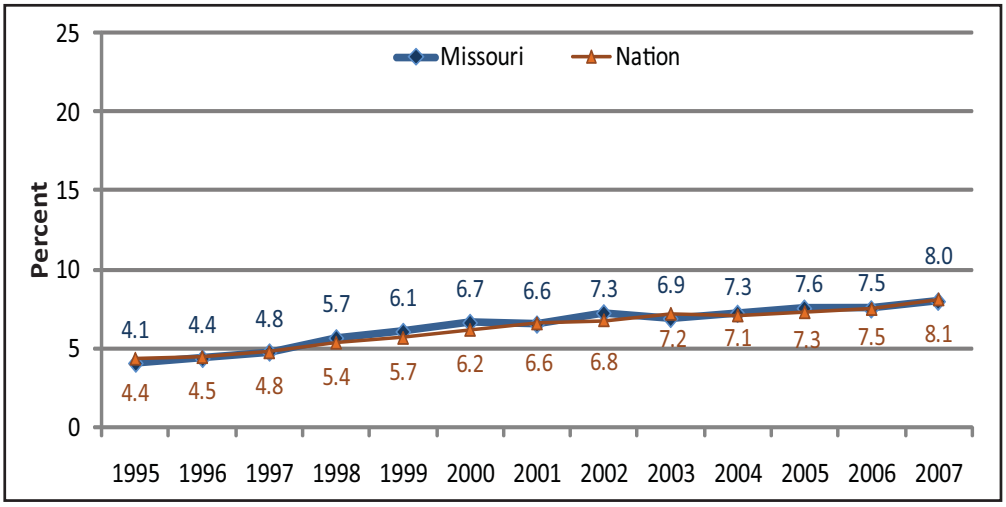
Healthy →Risk Factors →Pre-Diabetes → **Diabetes** →Complications →Death

DIABETES OVER THE YEARS

Missouri versus Nation

Missouri and the nation – which includes the 50 United States, the District of Columbia, and the United States territories – are seeing a similar increasing trend in the prevalence of diabetes.[9] Although both are increasing, the prevalence of diabetes in Missouri has varied little from the national average (Fig. 6).

Figure 6. Prevalence (%) of self-reported physician diagnosed diabetes* among adults, nation and Missouri, 1995-2007 (BRFSS).**



*Median prevalence

**The term self-reported physician-diagnosed diabetes means an individual responding to the BRFSS survey reported that a physician told them they had diabetes.

Healthy →Risk Factors →Pre-Diabetes → **Diabetes** →Complications →Death

DIABETES IN MISSOURI, 2007 — WHO IS MORE LIKELY TO HAVE IT?

In 2007, an estimated 359,168 (8 percent) adult Missourians self-reported physician-diagnosed diabetes.[9] Diabetes prevalence has statistically increased approximately twofold since 1995 (4.1 percent compared to 8 percent). Diabetes prevalence in 2007 varied significantly in Missouri by socio-demographics.

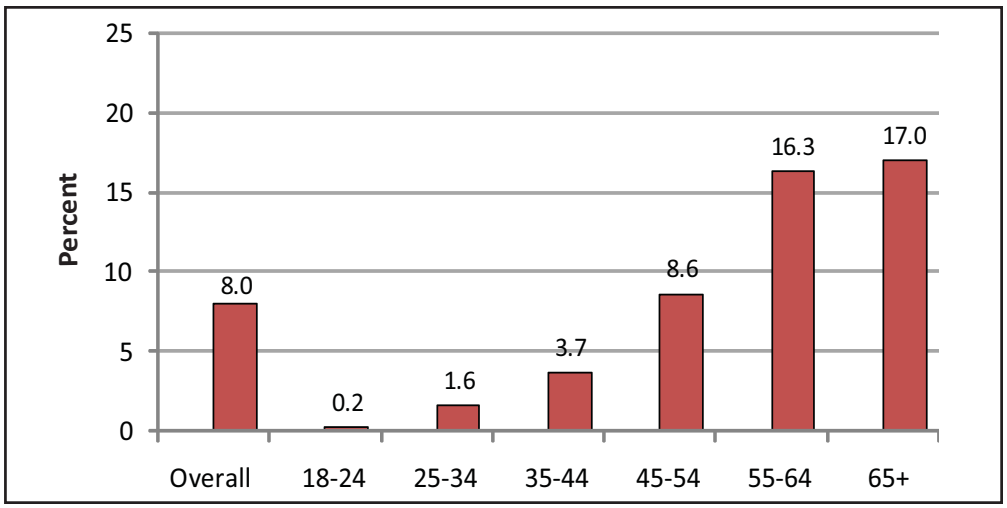
Diabetes Facts

- Almost three times higher among Missourians 65 years of age or older compared to the 18-44 age group
- Approximately two times higher among Missourians 65 years of age or older compared to the 45-54 age group
- More common among adults with annual household incomes below $15,000 compared to adults with annual household incomes above $25,000
- Higher among adults who are not high school graduates as compared to college attendees[10]

Age

Diabetes was more common among older Missourians than younger Missourians. Prevalence by age category significantly increases with every age group from age 35 to age 64. Missourians 65 years or older self-reported physician-diagnosed diabetes 10 times more frequently than the 25-34 age group (Fig. 7).

Figure 7. Prevalence (%) of diabetes by age groups, Missouri, 2007 (BRFSS).



Healthy →Risk Factors →Pre-Diabetes → **Diabetes** →Complications →Death

Diabetes Among Missouri's Children

Health care professionals realize that in Missouri there are not adequate surveillance tools to capture the burden of diabetes on its children. The CDC is also aware of the gap. However, the Department of Health and Senior Services compiles data from public schools that respond to a survey of students with special health care needs. School nurses complete the survey regarding the students in their schools. Eighty-two percent of Missouri school districts have been surveyed for two school years. In 2004-2005, 430 school districts representing 719,465 students responded. Of these 719,465 students, 1,905 had diabetes (357 had type 2 diabetes).[11] Type 2 diabetes accounted for 18.7 percent of diabetes among students in 2004-2005 versus 20 percent two years later. (Table 1).

Table 1. Incidence of diabetes among students in 430 school districts in school years 2004-2005 and 2006-2007 (Bureau of Genetics and Healthy Children [BGHC 2008]).

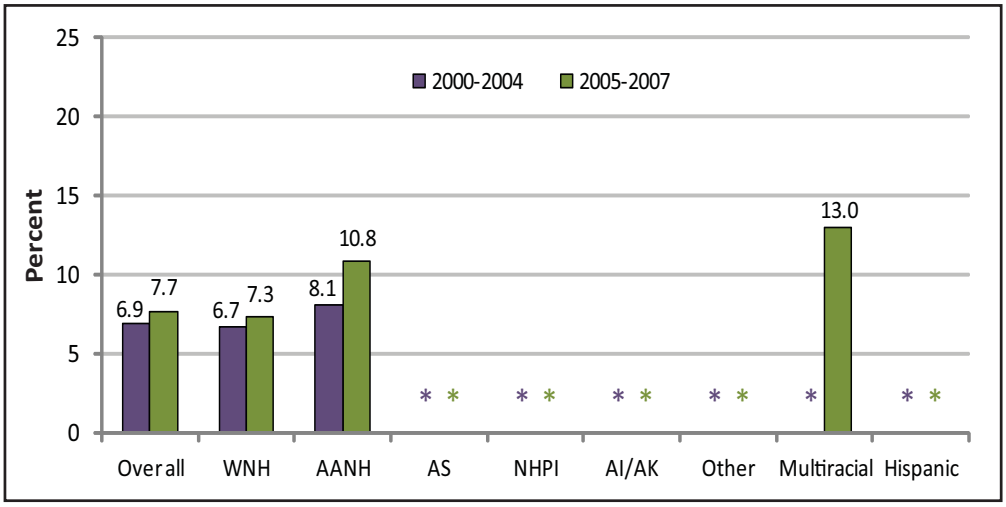
430 School Districts	Students Represented	Students with Diabetes out of All the Students	Students with Type 2 Diabetes out of All the Students	Percent of Students with Diabetes That Have Type 2
2004-2005	719,465	1,905 (0.26%)	357 (0.050%)	18.7%*
2006-2007	732,977	2,136 (0.29%)	427 (0.058%)	20.0%*

*Not statistically different

Race

From 2000 to 2007, African-Americans reported had the highest prevalence rate of self-reported physician-diagnosed diabetes compared to whites and overall racial groups.[9] African-Americans self-reported physician-diagnosed diabetes 1.5 times more than whites (Fig. 8).

Figure 8. Prevalence (%) of self-reported physician-diagnosed diabetes among adults by race and ethnicity, Missouri, 2000-2004 and 2005-2007 (BRFSS).



* or * Fewer than 50 events in numerator; rate is unstable

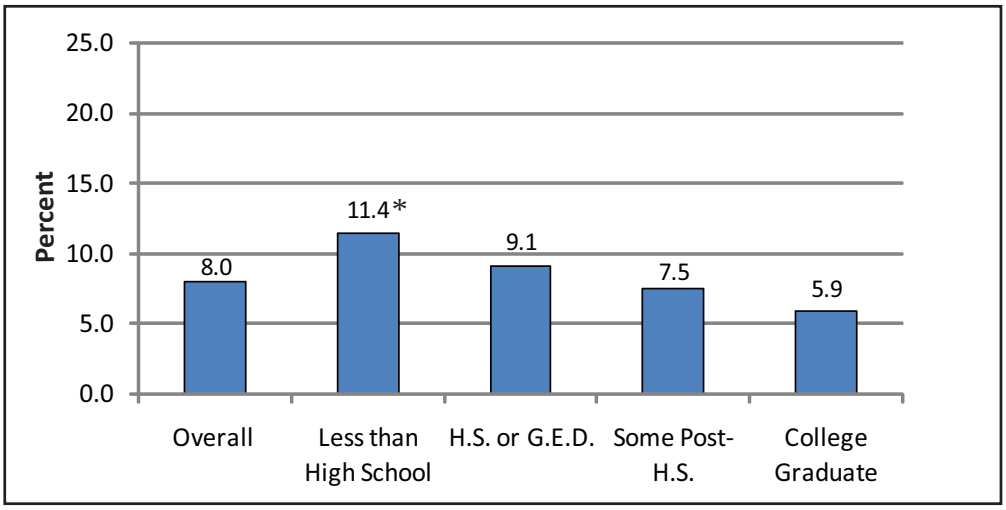
Abbreviations: WNH = White Non-Hispanic, AANH = African-American Non-Hispanic, AS = Asian, NHPI = Native Hawaiian/Pacific Islander, AI/AK = American Indian/Alaska Native

Healthy →Risk Factors →Pre-Diabetes → **Diabetes** →Complications →Death

Educational Attainment

College graduates are less likely to report having been told by a physician they have diabetes when compared to those who did not complete high school (Fig. 9). The difference is statistically significant. But the reporting does not differ significantly between high school graduates and those with some college, or between non high school graduates and those with some college.[9]

Figure 9. Prevalence (%) of self-reported physician-diagnosed diabetes by educational attainment, Missouri, 2007 (BRFSS).



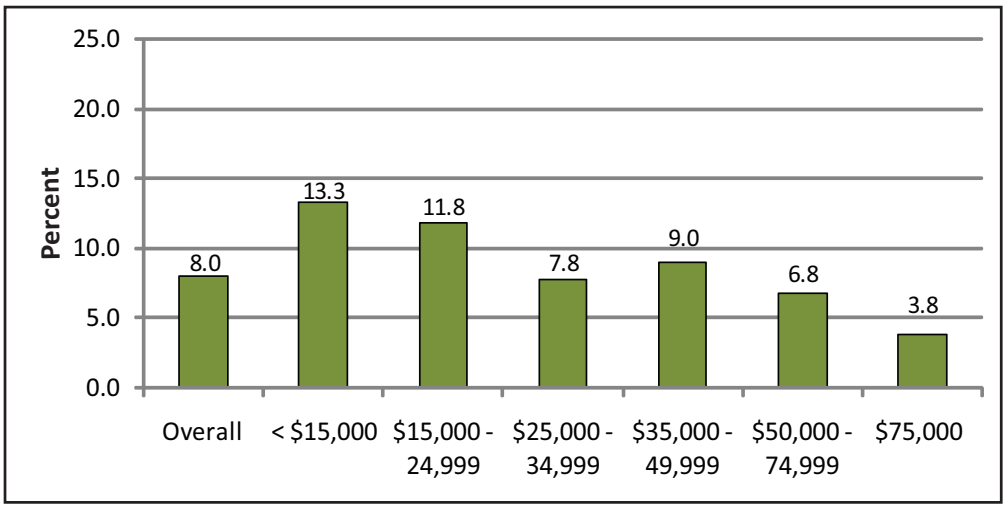
*Significantly higher than college graduate

Healthy →Risk Factors →Pre-Diabetes → **Diabetes** →Complications →Death

Income

As annual household income increases, Missourians are less likely to report having been told by a physician that they have diabetes (Fig. 10).[9] One in 8 individuals who has an annual household income less than $15,000 reported physician-diagnosed diabetes, compared to 1 in 26 with an annual household income of $75,000 or greater.

Figure 10. Prevalence (%) of diabetes by income, Missouri, 2007 (BRFSS).

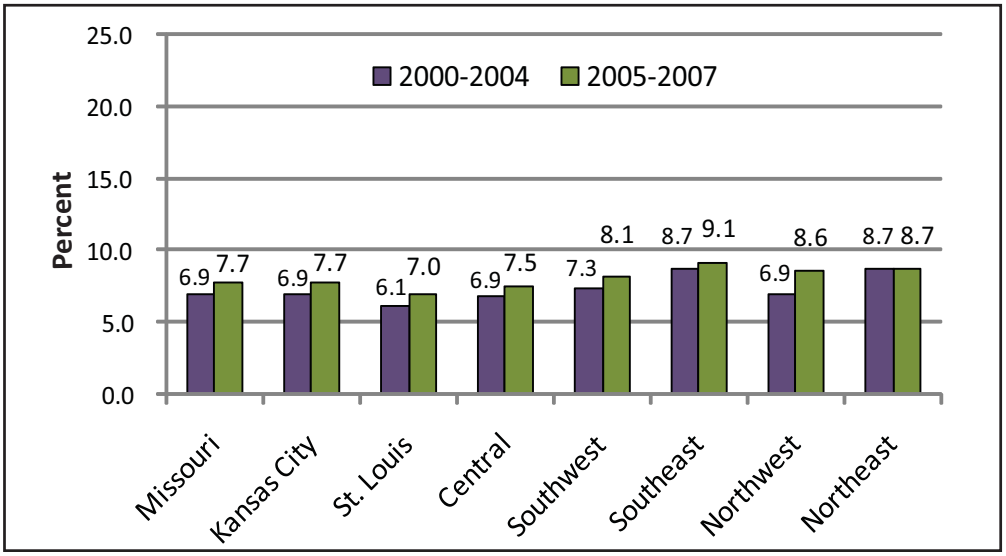


Healthy →Risk Factors →Pre-Diabetes → **Diabetes** →Complications →Death

Geographic Location

In 2000-2007, there is no significant difference in the prevalence of diabetes when comparing the BRFSS regions to the overall state of Missouri (Fig. 11).[9] However, differences between regions do exist for 2000-2004. Diabetes prevalence is statistically lower in the St. Louis BRFSS region compared to the Southeast and Northeast BRFSS regions.

Figure 11. Prevalence (%) of self-reported physician-diagnosed diabetes by BRFSS region, Missouri, 2000-2004 and 2005-2007 (BRFSS).

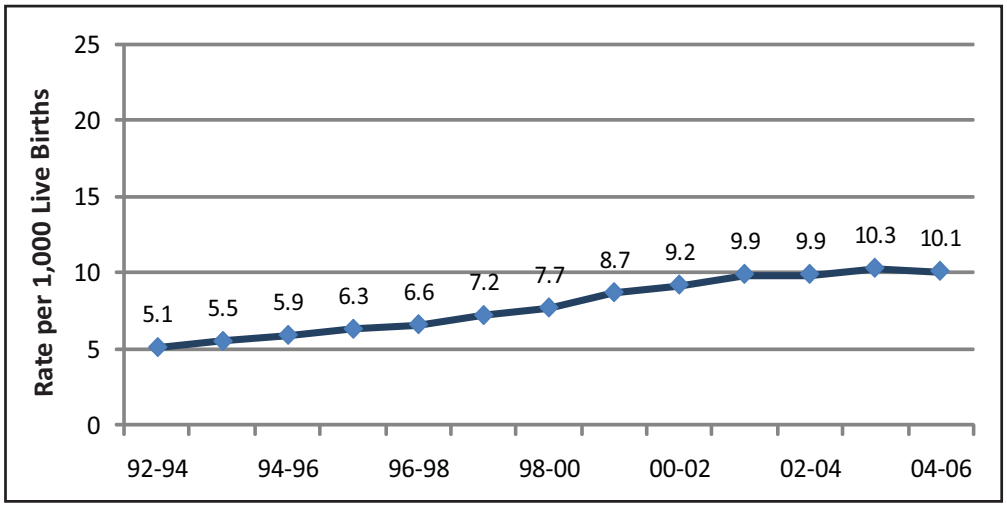


Healthy →Risk Factors →Pre-Diabetes → **Diabetes** →Complications →Death

Diabetes and Pregnancy

The prevalence of women in Missouri who develop diabetes during pregnancy can be tracked through birth certificate data and the BRFSS. Births to women with diabetes have been increasing (Fig. 12).[12] From 2000 to 2004, women with some type of diabetes gave birth to 14,268 infants. The rate of births to women with type 1 diabetes was 9.5 per 1,000 live births, and the rate of births to women with other diabetes was 27.9 per 1,000 live births.

Figure 12. Three-year moving average trend of births to women with diabetes, Missouri, 1992-2006 (Community Data Profiles, Diabetes).



Rate is per 1,000 live births. Statistically significant rate of increase.

Healthy →Risk Factors →Pre-Diabetes →Diabetes → **Complications** →Death

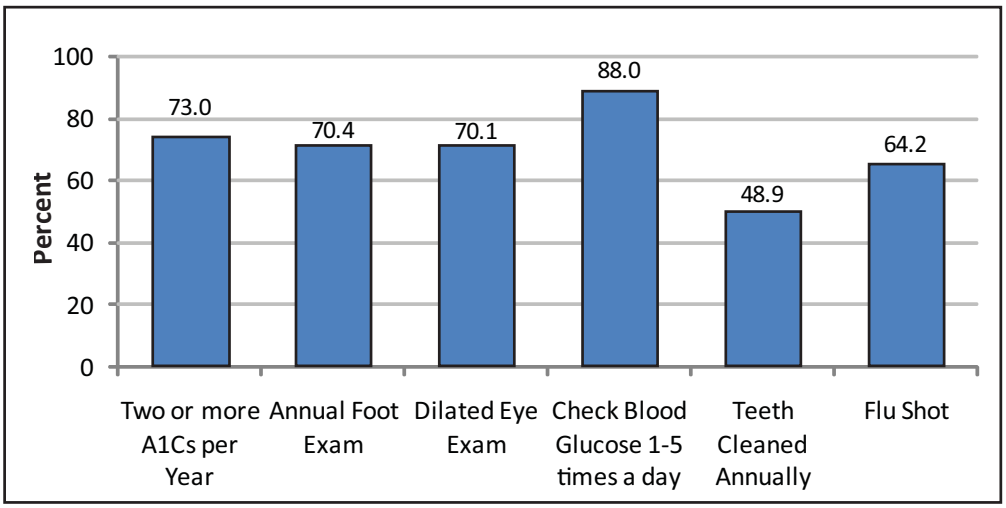
PREVENTION OF DIABETES COMPLICATIONS

Undiagnosed or uncontrolled diabetes can lead to debilitating and costly health complications such as heart disease, stroke, blindness, amputation and kidney failure. Fortunately, the majority of complications can be reduced in severity, delayed, or even prevented by keeping blood glucose levels under control, eating healthy, being physically active, working with a health care provider to keep blood pressure and cholesterol under control, and getting necessary screening tests and immunizations.

Preventive Screenings/Tests

Unfortunately, adequate surveillance measures do not exist for blood pressure monitoring and microalbuminuria screening. It is important for individuals with diabetes to receive preventive screenings/tests and immunizations (Fig. 13).

Figure 13. Prevalence (%) of preventive practices to prevent complications among adults with diabetes, Missouri, 2006 (BRFSS).



In 2006, of the Missourians who self-reported physician-diagnosed diabetes, 53.3 percent had their cholesterol checked within the last year.[12]

Healthy →Risk Factors →Pre-Diabetes →Diabetes → **Complications** →Death

Immunizations

People with diabetes are encouraged to receive a flu shot and a pneumonia immunization. They are at increased risk of dying with pneumonia or the flu compared to people who do not have diabetes. In 2006, 64.2 percent of Missourians with diabetes received a flu shot in the last 12 months and 58.3 percent had received a pneumonia immunization once during their lifetime.[12]

Lifestyle Modifications

Being overweight or obese can make diabetes management difficult. Independent from diabetes, obesity is a risk factor for hypertension, dyslipidemia and cardiovascular disease. In 2006, about 88 percent of Missourians who self-reported physician-diagnosed diabetes were overweight or obese (32.7 percent were overweight and 55.3 percent were obese).

Being physically active aids in managing an individual's diabetes. It assists in improving blood glucose control and in reducing cardiovascular risk factors, weight loss, and long-term weight management. Unfortunately, 38.1 percent of Missourians with physician-diagnosed diabetes reported no leisure time physical activity in the last 30 days.

Some studies of individuals with diabetes have consistently shown an increased risk of morbidity and premature death related to the development of macrovascular complications among smokers. Plus, smoking is linked to the premature development of microvascular complications of diabetes. In 2006, 16.7 percent of Missourians with diabetes reported being a current smoker.

Self-Management Education

In addition to screenings, immunizations and lifestyle modifications, there are diabetes self-management educational opportunities available to people with diabetes. Of the 2006 Missouri survey respondents with diabetes, only 54.6 percent had taken a course in how to manage their diabetes.

Healthy →Risk Factors →Pre-Diabetes →Diabetes → **Complications** →Death

DIABETES DISEASE COMPLICATIONS

Diabetes is a serious and costly health issue that contributes to many illnesses, reduced productivity, emergency room visits and hospitalizations.

Eye Problems/Retinopathy

In 2006, 25.7 percent of Missourians with diabetes reported a doctor told them diabetes had affected their eyes or that they had retinopathy.[12]

End-Stage Renal Disease

According to the National Kidney Foundation, African-Americans develop end-stage renal disease disproportionately to other races and develop kidney failure at an earlier age. African-Americans with diabetes experience kidney failure four times more often than whites.[13] More than 40 percent of all patients on dialysis have diabetes.[14]

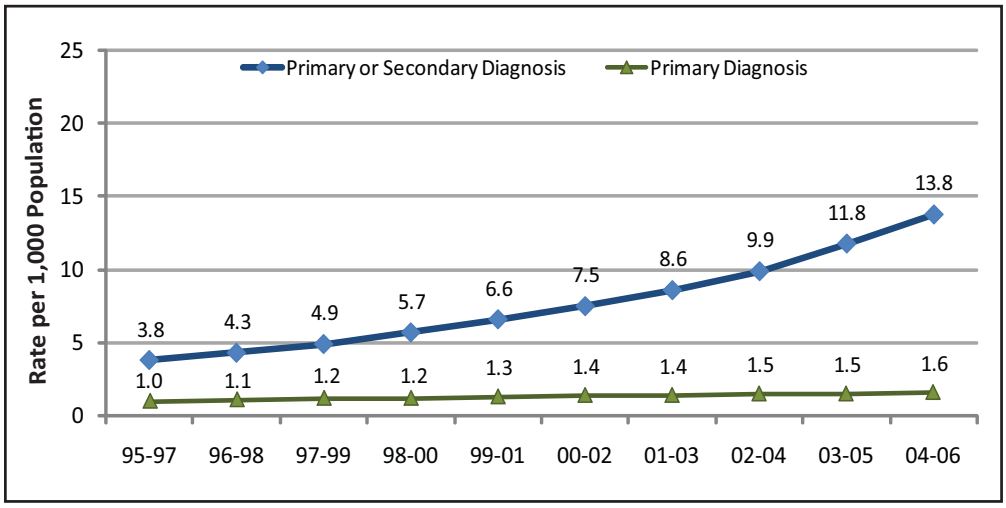
Healthy →Risk Factors →Pre-Diabetes →Diabetes → **Complications** →Death

Emergency Room Visits

Over the last ten years, the trend in the rate of emergency room visits from diabetes as the principal diagnosis, or as a principal or secondary diagnosis, has increased significantly.

In 2006, the rate of emergency room visits from diabetes as the principal diagnosis in Missouri was 1.5 times more common than in 1996.[12] Moreover, in 2004-2006, the rate of emergency room visits from diabetes as a principal or secondary diagnosis was 3.5 times greater than in 1995-1997 (Fig. 14).

Figure 14. Three-year moving average rate of emergency room visits with diabetes as the principal diagnosis and principal or secondary diagnosis, Missouri, 1995-2006 (Community Data Profiles, Diabetes).



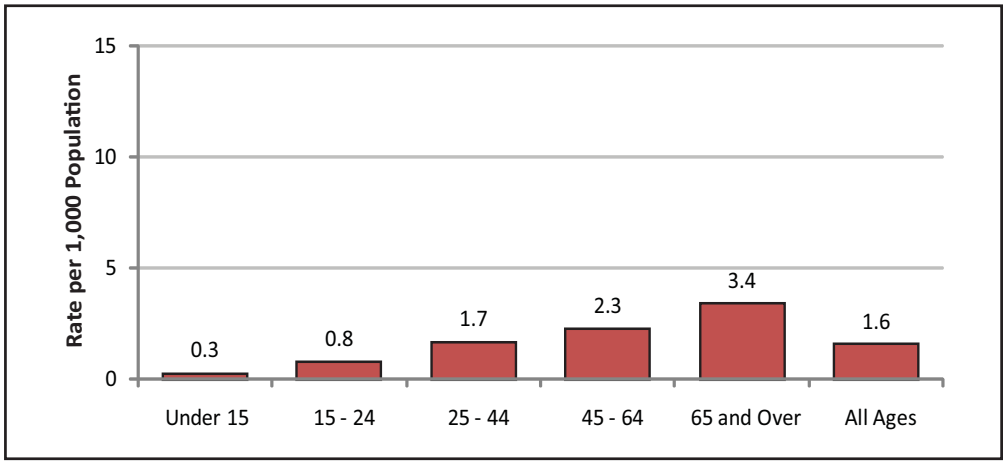
Rates are per 1,000 population and are age-adjusted to U.S. 2000 standard population.

Healthy →Risk Factors →Pre-Diabetes →Diabetes → **Complications** →Death

The overall trend by age shows that as age increases, the rate of emergency room visits in Missouri for diabetes care increases (Fig. 15). Fewer individuals 24 years of age and younger visited the emergency room for diabetes care compared to older age groups.[12] Visits to emergency rooms increased incrementally for each age group.

The rate of emergency room visits in Missouri by African-Americans is significantly higher than whites during a ten-year period (1995-2006). Over this ten-year period, the rate of emergency room visits by African-Americans was consistently three to five times higher than whites.

Figure 15. Rate of emergency room visits for diabetes care by age group, Missouri, 2006 (Emergency Room MICA*).



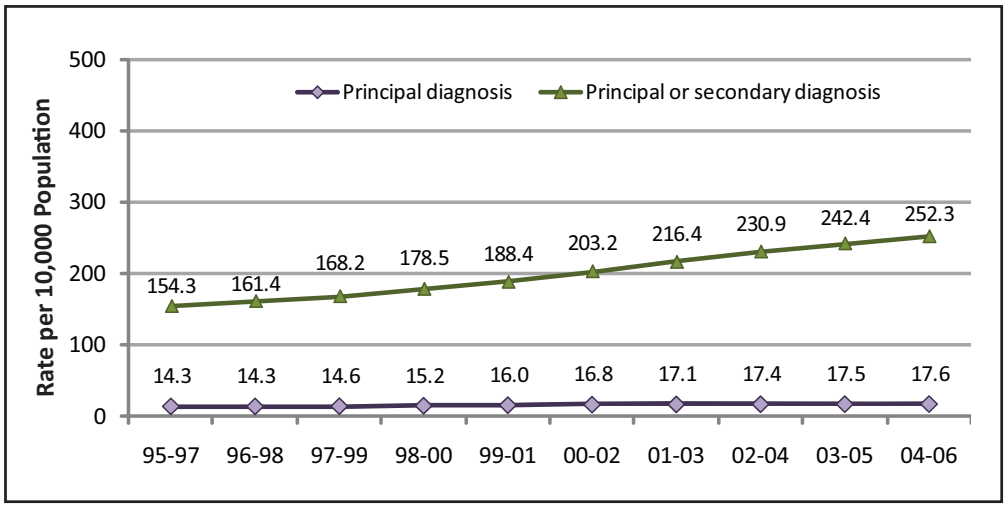
Rate per 1,000 population; age group specific crude rates. Rate for "All Ages" is age-adjusted to U.S. 2000 standard population.
*Missouri Information for Community Assessment (MICA)

Healthy →Risk Factors →Pre-Diabetes →Diabetes → **Complications** →Death

Hospitalizations

Over the last ten years, the rate of hospitalizations in Missouri from both diabetes as the principal diagnosis, and as principal or secondary diagnosis, has increased at a statistically significant rate (Fig. 16).[12]

Figure 16. Three-year moving average rate of hospitalizations from diabetes as the principal diagnosis and principal or secondary diagnosis, Missouri, 1995-2006 (Community Data Profiles, Diabetes).



Statistically significant increases. Rates are per 10,000 population per year and are age-adjusted to U.S. 2000 standard population.

Healthy →Risk Factors →Pre-Diabetes →Diabetes →Complications →**Death**

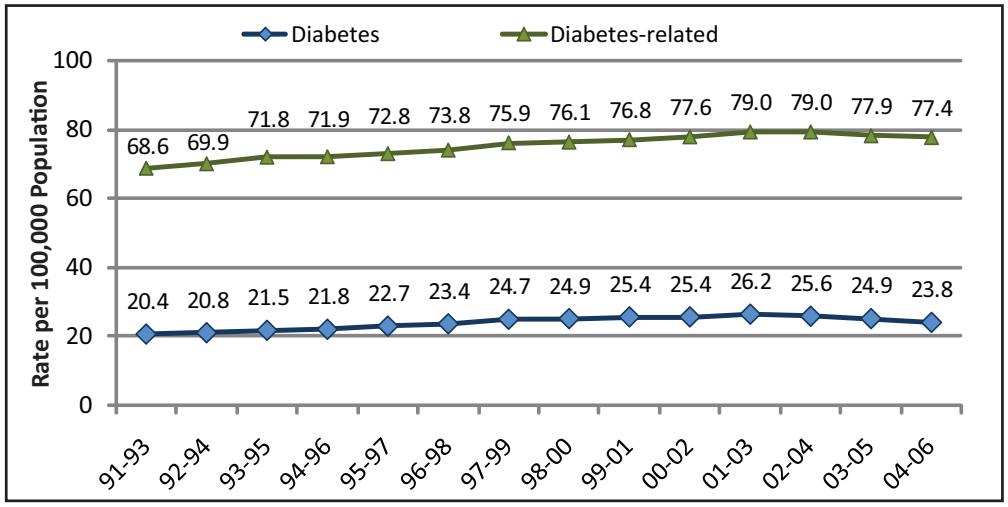
MORTALITY

Complications of diabetes that are not addressed early enough can result in death. Diabetes was the seventh-leading cause of death in Missouri between 1996 and 2006, with the exception of 2003 and 2004 when diabetes ranked as the sixth-leading cause of death.[15]

Most people with diabetes die from related complications rather than directly from the disease. Between 1996 and 2006, there were 16,366 deaths caused by diabetes (i.e., underlying) and 51,187 diabetes-related deaths (i.e., diabetes as an underlying or contributing cause).

Diabetes mortality (underlying cause) increased from 20.4 to 23.8 per 100,000 from 1991-1993 to 2004-2006 (Fig. 17).[16] Diabetes-related mortality went from 68.6 to 77.4 per 100,000 for the same time periods.

Figure 17. Age-adjusted diabetes mortality rates and diabetes-related mortality rates among Missourians, 1991-2006 (Community Data Profiles, Diabetes 2008).



Rate is per 100,000 population and is age-adjusted to U.S. 2000 standard population.

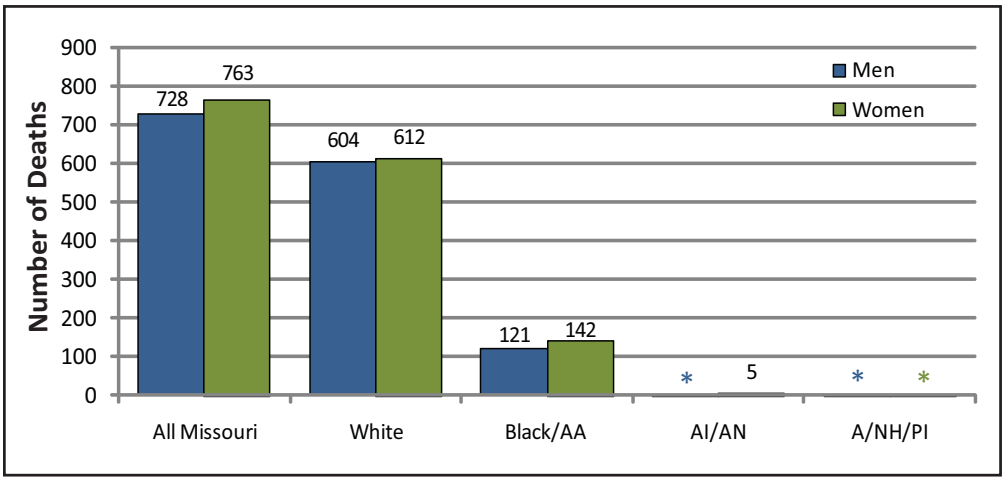
Healthy →Risk Factors →Pre-Diabetes →Diabetes →Complications →**Death**

Mortality by Gender, Race and Ethnicity

Even though diabetes was the seventh-leading cause of death among Missourians overall in 2006, it is the eighth-leading cause of death among whites and the fifth-leading cause of death among African-Americans.[15] Diabetes is the sixth-leading cause of death among Hispanics.

In 2006, age-adjusted mortality rates due to diabetes for Missouri men were 27.2 per 100,000 (728), compared to 20.0 per 100,000 (763) for Missouri women (Fig. 18).[16] The rate was significantly higher for African-Americans (52.0/100,000, 95% confidence interval [CI]: 45.8-58.4) compared to whites (20.8/100,000, 95% CI: 19.7-22.1) (Fig. 19). The rate for Hispanics and other races was too unstable to report. On average, 75 percent of Missourians who die from diabetes are aged 65 and over.[16]

Figure 18. Number of deaths attributed to diabetes by race and gender, Missouri, 2006 (Death MICA).

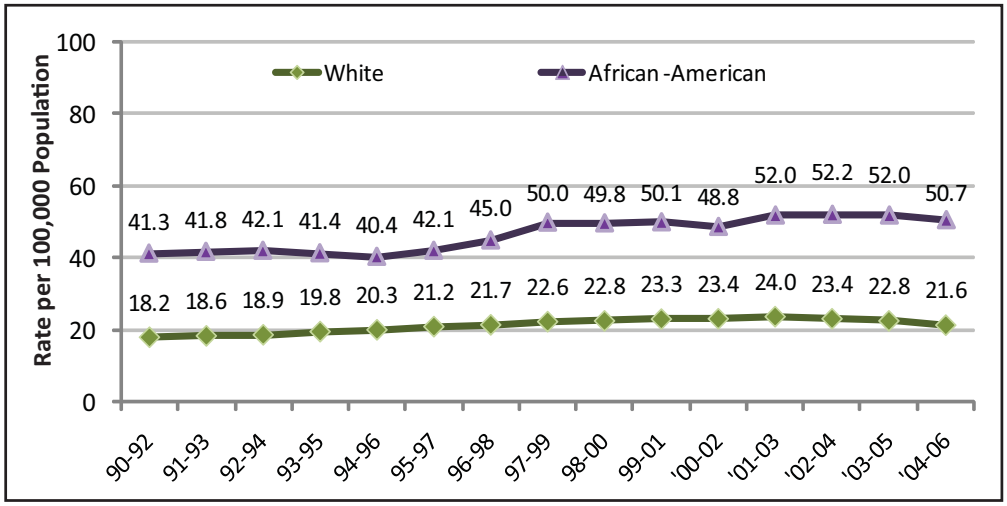


* or * Less than 5

Abbreviations: AA - African-American, AI - American Indian, AN - Alaska Native, A - Asian, NH - Native Hawaiian, PI - Pacific Islander

Healthy →Risk Factors →Pre-Diabetes →Diabetes →Complications →**Death**

Figure 19. Rate of mortality from diabetes as the underlying cause by race, Missouri, 1990-2006 (Community Data Profiles - Diabetes 2008).



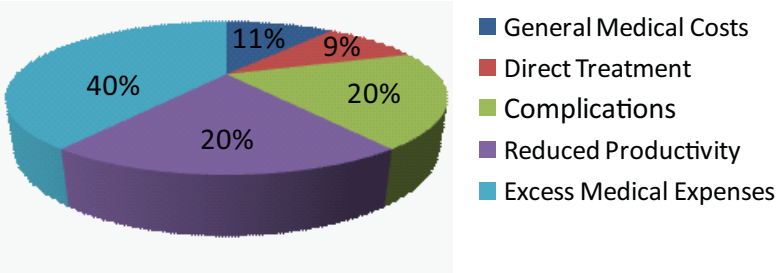
Rates are per 100,000 population and are age-adjusted to U.S. 2000 standard population.

COST OF DIABETES

Of all direct medical spending by Missourians, 11 percent is for diabetes care, approximately $2.72 billion.[17] By 2030, direct costs for diabetes may double.[17] People with diagnosed diabetes incur, on average, $11,744 in medical costs per year. Almost $7,000 of this cost is attributed to diabetes.[18] Diabetes has about doubled in prevalence in the past ten years in Missouri, increasing from 4.4 percent in 1996 to 8.0 percent in 2007.[17]

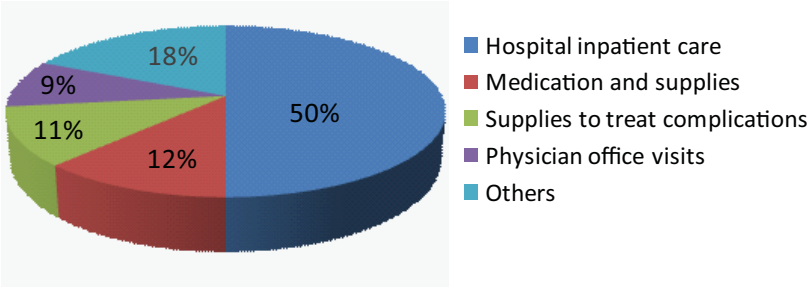
As a gauge of the distribution of the total estimated cost burden of diabetes, we look to the proportions estimated for the nation. In the United States in 2007, the total cost burden of diabetes was $174 billion, which included $116 billion in additional medical expenditures and $58 billion in reduced productivity (Fig. 20).[18]

Figure 20. Cost of diabetes in the U.S. (American Diabetes Association 2008).



Excess medical costs attributed to diabetes include $27 billion for care to treat diabetes directly, $58 billion to treat complications, and $31 billion in additional general medical costs (Fig. 21).

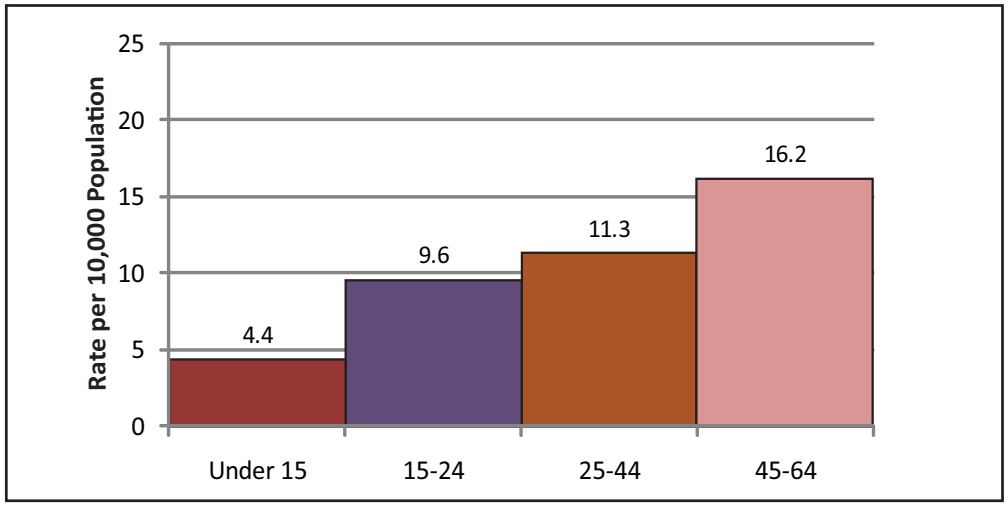
Figure 21. Composition of excess medical expenditures for diabetes in the U.S. (American Diabetes Association 2008).



Cost of Diabetes

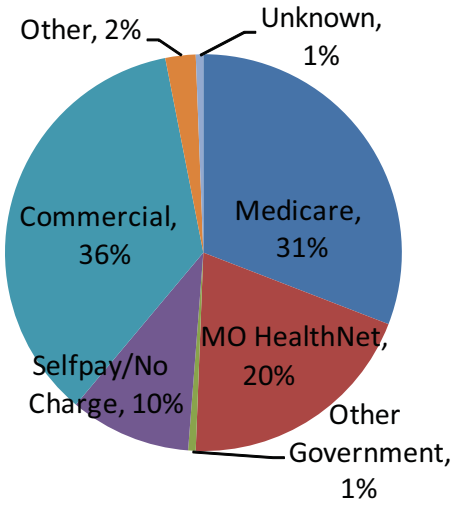
Hospital inpatient care and treatment of complications increase medical costs for people with diabetes. Information retrieved from the Missouri Information for Community Assessment (MICA) indicates that 74 percent of diabetes hospitalizations for Missouri residents under 65 in 2006 were considered preventable. Preventable hospitalizations are more common for Missouri residents over 45 years of age (Fig. 22). About half of the hospital stays for this age group are covered by Medicare or MO HealthNet, and half are covered by commercial sources or self-pay/no-charge (Fig. 23).[19]

Figure 22. Rate of preventable hospitalizations for diabetes, Missouri 2006 (Preventable Hospitalization MICA).



Rate is per 10,000 population and is age-adjusted for U.S. 2000 standard population

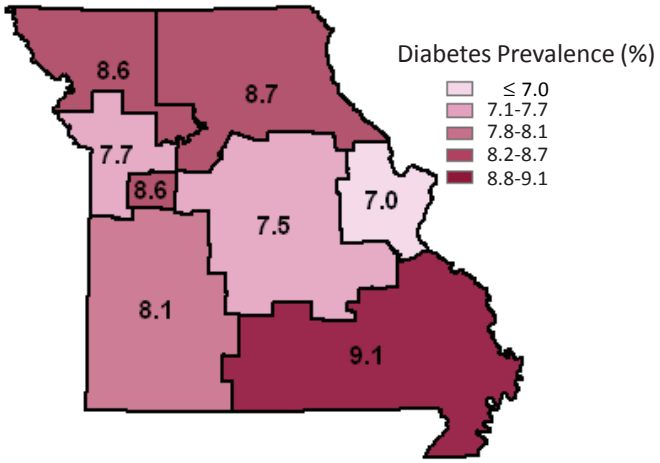
Figure 23. Pay sources for preventable hospitalizations among Missourians age 44-64, 2008 (Preventable Hospitalization MICA).



Many hospitalizations begin in the emergency room. In 2006 in Missouri, most of the nearly 10,000 emergency room visits for diabetes as a primary or secondary condition were covered by Medicare, Medicaid, commercial, or self-pay/no-charge sources. African-American visits were charged to self-pay/no-charge sources at a rate significantly higher than whites (0.9 per 1000, N=2,929 vs 0.1 per 1000, N=6,668).[20]

In 2005 alone, an estimated 1.4 million new cases of diabetes were diagnosed in the U.S.; Missouri reported an average of 12,000 new cases annually for 2005-2007.[21] Another 128,540 Missourians were estimated to have pre-diabetes in 2006. Diabetes occurs throughout the state of Missouri (Fig. 24).[9]

Figure 24. Prevalence (%) of self-reported physician-diagnosed diabetes, Missouri 2005-2007 (BRFSS).



Type 2 diabetes comprises 90 percent to 95 percent of diabetes diagnoses. Type 2 diabetes is considered preventable, as are the potential complications of the disease. With a good diet, daily physical exercise, appropriate health care screenings, and good self-management, much of the burden of type 2 diabetes can be overcome. Members of the Missouri Diabetes Public Health System partner in many ways to enhance the prevention of diabetes and to facilitate self-management of those with diagnosed diabetes.

The Missouri Department of Health and Senior Services (DHSS) will focus future efforts in reaching Missourians through a new grant from the Centers for Disease Control and Prevention (CDC), in collaboration with the Tobacco Use Prevention and Cessation Program, the Chronic Disease Primary Prevention Program (CDPP), and the Behavioral Risk Factor Surveillance System (BRFSS). These programs will develop projects and grant opportunities that will assist in eliminating disparities and preventing diabetes and diabetes complications.

MISSOURI DIABETES STRATEGIC PLAN

Overview

Research clearly shows that increasing physical activity levels and improving healthy eating habits can prevent or delay type 2 diabetes. Early detection and treatment for the prevention of diabetes-related complications is the key to living well with diabetes.

Missourians at risk for and with diabetes are faced with surroundings that encourage unhealthy eating and discourage physical activity. Diabetes is a complex disease. People who have it, and their families, must take proactive care steps. Creating supports in communities and health systems that result in optimal care and active self-management of a person's diabetes requires change at multiple levels.

The Missouri Diabetes Prevention and Control Program (MDPCP) seeks to provide leadership for diabetes prevention and control efforts in the state of Missouri. MDPCP strives to accomplish this through providing and promoting information, education, policies and programs aimed at reducing the impact of diabetes on Missourians. The goals of MDPCP focus on Healthy People 2010 and the Centers for Disease Control and Prevention (CDC).

To begin the coordination of this effort, the Missouri Diabetes Strategic Plan (Strategic Plan) has been developed. Its intended purpose is to serve as a blueprint for collaborative statewide diabetes prevention and control over the next few years. In order to impact this significant health issue, it will take the combined efforts and resources of many partners to achieve sustainable progress in addressing the prevention, early detection and improved management of diabetes.

The Strategic Plan's common vision developed by the statewide diabetes partners includes four priority goals. Planning partners also developed and agreed upon the key strategies for each goal, as well as related action steps to implement each strategy.

The following values guide the actions steps outlined in the Strategic Plan:

- Decrease risk factors associated with pre-diabetes and diabetes to improve quality of life for persons with diabetes.
- Effective proven approaches utilized to impact the prevention, early detection and treatment of diabetes.
- Support changes being implemented on many levels of influence so approaches can be effective.

MDPCP and the Missouri Diabetes Strategic Planning Work Group developed the Strategic Plan through a series of planning meetings. It includes strategies and actions recommended by these diabetes stakeholders and addresses the need for increased involvement from communities, health systems and the workplace. Additionally, the Strategic Plan addresses important issues relating to state policy, effective communication and the increase of surveillance and data management systems.

Overview

In short, the Strategic Plan outlines approaches to address the continuum of the prevention of pre-diabetes, early detection and improved treatment of pre-diabetes and diabetes, and the prevention of complications for those with diabetes based on evidence-based interventions and best practices while incorporating action steps important to stakeholders at the local and state level. See Appendix C, p. 67, for the logic model.

The Strategic Plan also builds upon the Healthy Missourians Initiative to prevent obesity, a major risk factor for pre-diabetes and diabetes.

Individual, community and health system approaches, along with specific goals, strategies and actions to prevent pre-diabetes and diabetes and improve diabetes care, are outlined on the following pages. The opportunity exists to take advantage of the latest research and scientific advances and expand diabetes prevention and treatment activities statewide. Working together, human and economic resources can be maximized to reduce the impact of this devastating disease.

In 2004, diabetes stakeholders convened to conduct an assessment of the Missouri Diabetes Public Health System using the National Public Health Performance Standards. The assessment identified four priority areas for improvement:

1. Data/surveillance
2. Access/insurance
3. Partnerships
4. Dissemination/education

Work groups representing each of the four priority areas met to assess system readiness, brainstorm interventions, and develop performance improvement plans to guide the strategic planning and quality improvement efforts of the Missouri Diabetes Public Health System and the Missouri Diabetes Prevention and Control Program.

The strategic planning process began in June 2005 with the development of the following vision statement by the Missouri Diabetes Strategic Planning Work Group:

> **"New cases of diabetes will become rare in Missouri, and people who do develop diabetes will live longer, healthier lives due to effective education, early intervention, access to care and coordination of care."**

The Missouri Diabetes Strategic Planning Work Group was comprised of members of the Missouri Diabetes Prevention and Control Program Advisory Board, diabetes stakeholders, and staff of the Missouri Diabetes Prevention and Control Program. A list of the work group members can be found in Appendix D, p. 69.

In June 2005, work group participants reviewed a summary of the barriers/gaps and potential strategies to address the four priority areas identified during the assessment of the Missouri Diabetes Public Health System. Additional strategies to address the barriers/gaps were also identified.

To help inform decision-making, the second strategic planning session in July 2005 began with a presentation on the prevalence and burden of diabetes in Missouri, based on data from the Behavioral Risk Factor Surveillance System. Participants prioritized nine barriers/gaps that had previously been identified. This was done using a relationship-mapping exercise that scored each barrier/gap based on its influence on the other barriers/gaps. The top three barriers/gaps follow:

- Current data systems are incomplete, and there are significant quality problems with existing data. Legal issues limit information sharing among organizations.
- Diabetes-related partnerships and collaborations are weak and incomplete.
- Evaluation of programs and interventions is limited and ineffective, so information to improve programs and the overall system is lacking.

Based on their feasibility and impact, participants then used an "idea filter" method to categorize the strategies for the top three barriers/gaps. Strategies were sorted into four categories ranking feasibility and impact. At the end of the session, participants identified potential partners needed to plan the implementation of the selected strategies.

In the third strategic planning session held in September 2005, MDPCP presented compiled results from the previous meetings and developed goals (formerly called barriers/gaps) along with strategies and actions:

GOAL A: Improve behaviors and practices for the prevention, early detection, and improved management of diabetes.

GOAL B: Increase state-level public policies that promote behaviors and practices for the prevention, early detection and management of diabetes.

GOAL C: Increase the effectiveness of communication that results in people with diabetes or at risk for diabetes improving behaviors and practices for the prevention, early detection and management of diabetes.

GOAL D: Improve surveillance, evaluation and research to support prevention, early detection and management of diabetes.

MDPCP assumed lead responsibility for Goal D. Two subgroups were formed, one subgroup reviewed Goal A and the other Goals B and C. The subgroups prioritized the actions for each of the goal strategies, identifying those that should be the beginning focus in implementation planning. The ranking was done by selecting the three actions overall that should be addressed first, voting on the ranking, and discussing of the results if needed to come to a consensus. The subgroups also brainstormed a list of partners to be invited to participate in the implementation planning process for each strategy.

Overall Goal

Improve the health and quality of life for persons with, and at risk for, diabetes

Short-Term Outcomes

- Reduce obesity
- Reduce smoking
- Increase physical activity
- Increase healthy eating habits
- Improve blood pressure control
- Improve blood cholesterol management
- Increase blood sugar testing (A1C)
- Increase dilated eye exams
- Increase annual foot exams
- Increase annual dental exams
- Increase influenza and pneumococcal immunizations
- Increase availability and access to care, self-management programs and supports

Long-Term Outcomes

- Reduce rate of hospitalizations for influenza and pneumonia
- Reduce cardiovascular events
- Reduce rate of blindness
- Reduce rate of lower extremity amputations
- Reduce rate of diabetes-related kidney disease

Short-Term Objectives

Obesity (BMI ≥30)

- Among adults at risk of developing diabetes based on obese weight status, reduce the average annual prevalence increase of obesity from one-half percent to one-third percent by 2010.
- Among adults (18 years of age or older) with diabetes, reduce the average annual prevalence increase of obesity from 1.8 percent to 1.5 percent by 2010.
  Data source: BRFSS[9]

Smoking (Current Smoker)

- Among adults with diabetes, reduce the prevalence of current smokers from 20.4 percent in 2003 to 18.3 percent by 2010.
  Data source: BRFSS[9]

Physical Activity

- Among youth at risk of developing diabetes (i.e., obese), decrease the prevalence of those individuals who are inactive from 37.5 percent in 2005 to 35 percent by 2009.
- Among adults with diabetes, increase the prevalence of those individuals who are participating in leisure time physical activity from 63.2 percent in 2004 to 65.3 percent by 2010.
  Data source: Youth Tobacco Survey (YTS),[22] BRFSS[9]

Healthy Eating Habits

- Among youth at risk of developing diabetes (i.e., overweight), increase the prevalence of those individuals who consume five or more servings of fruits and vegetables per day from 14.7 percent in 2005 to 17.0 percent by 2009.
- Among adults with diabetes, increase the prevalence of those individuals who consume five or more servings of fruits and vegetables per day from 28.2 percent in 2004 to 30.5 percent by 2010.
  Data source: YTS,[22] BRFSS[9]

Blood Pressure Control

- Among adults with diabetes and hypertension, increase the prevalence of those individuals who control their blood pressure from 57.8 percent in 2003 to 60 percent in 2009.
  Data source: BRFSS[9]

Blood Cholesterol Management

- Among adults with diabetes, increase the prevalence of those individuals who have ever had their blood cholesterol checked from 91.5 percent in 2003 to 95.0 percent in 2009.
  Data source: BRFSS[9]

Blood Sugar Testing

- Among adults with diabetes, increase the prevalence of individuals who receive two or more A1C tests per year from 68.4 percent in 2004 to 79.8 percent in 2010.
  Data source: BRFSS[9]

Dilated Eye Exam

- Among adults with diabetes, increase the prevalence of individuals who have received a dilated eye exam in the past 12 months from 66.9 percent in 2004 to 73.9 percent in 2011.
  Data source: BRFSS[9]

Annual Foot Exam

- Among adults with diabetes, increase the prevalence of individuals who receive a foot exam by a health care professional from 68.4 percent in 2004 to 75.4 percent in 2010.
  Data source: BRFSS[9]

Annual Dental Exam

- Increase the prevalence of adults who visited the dentist in the past 12 months from 51.6 percent in 2006 to 54.0 percent in 2010.
  Data source: BRFSS[9]

Influenza and Pneumococcal Immunizations

- Among adults with diabetes, increase the prevalence of individuals who have received an influenza immunization in the past 12 months from 64.1 percent in 2004 to 70.0 percent in 2010.
- Among adults with diabetes, increase the prevalence of individuals who have ever received a pneumococcal immunization from 55.4 percent in 2004 to 62.0 percent in 2010.
  Data source: BRFSS[9]

Availability and Access to Care, Self-Management Programs and Supports

- Among adults with diabetes, increase the prevalence of individuals who have some kind of health care coverage from 88.7 percent in 2004 to 90.0 percent in 2010.
- Among adults with diabetes, increase the prevalence of individuals who have ever taken a course in diabetes self-management from 55.6 percent in 2004 to 71.6 percent in 2010.
  Data source: BRFSS[9]

Long-Term Objectives

- Increase the percentage of Missouri adults with diabetes who have received a vaccination for pneumonia from 58.3 percent in 2006 to 60.3 percent in 2010 and increase annual flu vaccination from 64.2 percent in 2006 to 66.2 percent in 2010.
  Data source: Diabetes Profile[12]

- Reduce inpatient hospitalizations for cardiovascular events (hospitalizations for heart attack [100]* and hospitalizations for stroke [109]*) among adults with diabetes from 4.7 percent and 4.9 percent, respectively, in 2006, to 4.2 percent and 4.4 percent in 2010.
  Data source: Patient Abstract System [23]

- Reduce eye complications and/or diabetes retinopathy among those with diabetes from 25.7 percent in 2006 to 24.7 percent in 2010.
  Data source: Diabetes Profile[12]

- Reduce the rate of lower extremity amputations among those with diabetes from 2.5 percent as a 4-year average (2002-2006) to 2.0 percent as a 4-year average (2007-2010).
  Data source: Community Data Profiles, Diabetes[12]

- Reduce rate of inpatient hospitalizations for (end stage) chronic renal failure [158]* among all Missourians with diabetes from 67.8 percent in 2006 to 65.8 percent in 2010.
  Data source: Patient Abstract System [23]

*CCS (Clinical Classification Software) clinical diagnosis code

GOAL A:

Improve behaviors and practices for the prevention, early detection and improved management of diabetes.

Strategy 1: **Communities** - Coordinate and implement programs and supports for communities to improve preventative care habits and practices for the prevention, early detection and management of diabetes.

Actions:

1. Create local diabetes networks. Cultivate and coordinate advocacy partnerships across "grassroots" organizations, businesses, employers, and other organizations to improve diabetes care, including reimbursement for diabetes self-management training and medical nutrition therapy services.
2. Increase the number of community resources (programs, policies and environmental changes) that support diabetes prevention and self-management, including tools to assess community resources and gaps, and the Missouri Diabetes Strategic Plan as a communication and guidance tool. Coordinate efforts to strengthen technical assistance for local/regional diabetes-related partnerships and coalitions.
3. Increase awareness of screening criteria for pre-diabetes and diabetes.

Suggested stakeholders needed for implementation planning:

- St. Louis and Kansas City diabetes coalitions and similar coalitions
- National Kidney Foundation
- University of Missouri Extension
- Missouri Association of Local Public Health Agencies
- American Diabetes Association
  (Missouri chapters—Kansas City, St. Louis and Springfield)
- Missouri Kidney Program
- Community health centers
- Missouri Rural Health Association
- Universities (communications departments)
- Area Agencies on Aging
- AARP
- Employers/businesses
- Hospitals
- Schools
- Churches

Strategy 2: **Health Care Systems** - Improve systems of care, provider knowledge, skills and resources to enhance prevention, early detection and management of diabetes.

QUALITY IMPROVEMENT

Actions:

1. Achieve diabetes care outcomes by implementing a system of care model for improvement of diabetes patients, including standards of care related to mental health.
2. Identify and disseminate validated tools to help providers communicate strategies to help move patients toward change.
3. Link health care systems with community resources for patient referral to improve diabetes self-management.

Suggested stakeholders needed for implementation planning:

- Missouri Primary Care Association
- Free Clinic Association
- Primaris (Missouri's Medicare Quality Improvement Organization)
- MO HealthNet
- Missouri Alliance for Home Care
- Missouri Nurses Association
- American Association of Diabetes Educators (Missouri chapters-Kansas City, St. Louis)
- Physician groups
- Dieticians
- Nurse Practitioners
- Missouri Hospital Association
- Area Health Education Centers

WORKFORCE DEVELOPMENT

Actions:

1. Develop a coordinated system for training multidisciplinary health professionals and other staff on current diabetes-related practices utilizing new learning technologies (e.g., interactive Internet modules).
2. Develop partnerships with medical, pharmacy and nursing schools; area health education centers; state and local medical and pharmacy societies; and other health professionals (such as personnel in local public health agencies, Area Agencies on Aging, and minority health offices) to provide educational and cultural competency training experiences and resources utilizing national standards for health care professionals to improve the cultural appropriateness of diabetes care for the populations served.
3. Encourage consistent training for health care professionals to address diabetes management issues in the workplace.

Suggested stakeholders needed for implementation planning:

- Primaris (Missouri's Medicare Quality Improvement Organization)
- Certified diabetes educators
- Children's Mercy Hospital (health management)
- Managed care organizations
- Pharmaceutical organizations
- Nursing schools/colleges
- Coordinating Board for Higher Education
- Missouri Hospital Association
- Statewide cultural training
- Area health education centers
- Endocrinologists
- Primary care physicians

Strategy 3: **Workplace** - Support changes in the workplace to improve preventive care habits and practices for the prevention, early detection and management of diabetes.

Actions:

1. Support the *Preventing Obesity and Other Chronic Diseases: Missouri's Nutrition and Physical Activity Plan,*[25] which links work sites with community resources to improve diabetes prevention and self-management.
2. Educate employees about their benefit options to encourage choice of plans that provide services for diabetes prevention and management.
3. Educate employers about health care plan options to encourage purchase of services and medical benefits that cover recommended diabetes-related services and supports.

Suggested stakeholders needed for implementation planning:

- St. Louis Area Business Health Coalition
- Mid-America Health Care Coalition (Kansas City and Cape Girardeau)
- Missouri Department of Insurance
- Black Womens' Health Center
- Chief executive officers and human resources directors of health organizations
- Missouri Chamber of Commerce
- St. Louis Diabetes Coalition and similar coalitions
- Health Communications Resource Lab
- Universities
- Missouri Department of Economic Development
- Employees, labor unions
- Missouri Rural Network
- Missouri Retailers Association
- Missouri Primary Care Association
- Missouri Hospital Association
- Occupational Health Association
- Wellness coordinators

GOAL B:

Increase state-level public policies that promote behaviors and practices for the prevention, early detection, and improved management of diabetes.

Strategy 1: **State Policy** - Strengthen state policies to support diabetes prevention and control.

Actions:

1. Convene partners in the diabetes system to gather information about policy gaps/needs and identify priorities for policy changes in various settings (schools, workplaces, etc.) and in state-operated programs (e.g., MO HealthNet, WIC).
2. Work with partners to develop a policy "agenda" and coordinate advocacy efforts among broad-based partner organizations.
3. Support nutrition and physical activity policies outlined in *Preventing Obesity and Other Chronic Diseases: Missouri's Nutrition and Physical Activity Plan.*[24]

Suggested stakeholders needed for implementation planning:

- American Diabetes Association (Missouri chapters-Kansas City, St. Louis and Springfield)
- Missouri Kidney Foundation
- Missouri Foundation for Health
- Health Care Foundation of Greater Kansas City
- MO HealthNet
- Missouri Department of Economic Development
- St. Louis and Kansas City diabetes coalition and similar coalitions
- Missouri Department of Insurance
- Business coalitions
- Missouri Rural Health Association
- AARP
- Missouri Hospital Association
- Missouri Association for Social Welfare
- Legislators
- Legal Services of Eastern Missouri, Western Missouri, Central Missouri
- Missouri Department of Elementary and Secondary Education
- Missouri Department of Health and Senior Services (WIC, Minority Health, Women's Health, Rural Health)
- Health care plans
- Missouri Department of Natural Resources
- Missouri Parks and Recreation Association
- Missouri Association of Local Public Health Agencies
- Missouri Dental Association

Strategy 2: **Health Care Coverage** - Promote coverage for pre-diabetes and diabetes services by health care plans and businesses for the prevention, early detection and improved management of diabetes.

Actions:

1. Develop partnerships with employers and insurance providers to support pre-diabetes and diabetes coverage that provides full coverage for all services and supplies needed for comprehensive diabetes care, including self-management training and medical nutrition therapy.
2. Educate consumers on reimbursement issues and using a full range of health care plan options available to them.
3. Build support for MO HealthNet coverage of diabetes self-management training.

Suggested stakeholders needed for implementation planning:

- Employer coalitions - human resources, chief executive officers
- Missouri Department of Insurance
- Health care plans
- Certified diabetes educators (diabetes and obesity experts)
- American Diabetes Association
  (Missouri chapters-Kansas City, St. Louis and Springfield)
- Epidemiologists
- AARP
- Other consumer groups
- Labor unions
- Legislators
- Health economists
- Vocational rehabilitation
- Missouri Department of Elementary and Secondary Education
- Rehabilitation Services for the Blind

GOAL C:

Increase the effectiveness of communication that results in people with diabetes or at risk for diabetes improving behaviors and practices for the prevention, early detection and management of diabetes.

Strategy 1: **Communication System** - Create a system to increase effective communication among diabetes partners that results in the improved prevention, early detection and management of diabetes.

Actions:

1. Create a mechanism to foster communication and collaboration among existing communities, health systems, and business coalitions, incorporating entities whose missions overlap with diabetes such as local public health agencies, Area Agencies on Aging, and minority health offices.
2. Establish network to inform Missourians and state policymakers about diabetes issues, the impact of diabetes, and specific policy changes needed by identifying or developing fact sheets highlighting the human and economic costs in Missouri (i.e., costs and benefit of good diabetes management).
3. Create a forum for diabetes educators to disseminate consistent information.

Suggested stakeholders needed for implementation planning:

- American Diabetes Association (Missouri chapters-Kansas City, St. Louis and Springfield)
- Experts in Web site development
- Missouri Healthcare Association
- University of Missouri School of Journalism and other university communications departments
- National Library Association
- American Association of Diabetes Educators (Missouri chapters-Kansas City, St. Louis)
- Mass media (Telemundo Kansas City, Missouri Broadcasters Association, Missouri Press Association, Learfield Communications)
- Medical society journals
- Missouri Association of Local Public Health Agencies
- University of Missouri Sinclair School of Nursing
- Area health education centers
- St. Louis and Kansas City diabetes coalitions and similar coalitions
- Health care plan providers (employers)
- Missouri Hospital Association
- Organization of health care executives (St. Louis)

Strategy 2: **Tools** - Develop a central repository of tools to support enhanced messages that improve prevention, early detection and management of diabetes.

Actions:

1. Develop culturally appropriate, updatable resource toolkits for patients and professionals, available in print and online, to assist disparate populations (e.g., succinct, user-friendly guidelines, algorithms, pocket cards, and chart checklists, available in multiple versions of varying literacy levels, languages, and ages).
2. Create and disseminate tools for communicating evidence-based best practices, and tools for community assessment and health system quality improvements.
3. Partner with insurance companies and other organizations to develop tools that demonstrate the financial benefits of providing services, early detection and disease management for their employees.

Suggested stakeholders needed for implementation planning:

- Primaris (Missouri's Medicare Quality Improvement Organization)
- Allied health professionals
- American Association of Diabetes Educators (Missouri chapters-Kansas City, St. Louis)
- American Diabetes Association (Missouri chapters-Kansas City, St. Louis and Springfield)
- National Kidney Foundation
- Missouri Kidney Program
- Hispanic Nurses Association
- Missouri Health Association Consumer Health Translation
- Missouri Society for Public Health Education
- Schools of public health
- Insurance companies
- Missouri Department of Insurance
- University economics departments
- University of Missouri Sinclair School of Nursing
- Missouri Department of Health and Senior Services' Office of Minority Health

Strategy 3: **Public Awareness** - Increase public awareness campaigns that result in the improved prevention, early detection and management of diabetes.

Actions:

1. Develop, conduct and evaluate educational initiatives that motivate target audiences to use safe and effective methods for improving preventive care practices and habits.
2. Work with other state initiatives, communities, health systems and organizations involved in diabetes management to promote simple, consistent messages for high-risk individuals, persons with diabetes and their families.
3. Convene a symposium of communication managers representing Missouri, national health-related organizations and industry to discuss diabetes-related communication objectives, messages, and strategies for public awareness campaigns.

Suggested stakeholders needed for implementation planning:

- Missouri Broadcasters Association
- Missouri Press Association
- Marketing researchers
- University of Missouri Center for Advanced Social Research
- National Cancer Institute
- St. Louis University

GOAL D:

Improve surveillance, evaluation and research to support diabetes prevention, early detection and management.

Strategy 1: **Surveillance and Data Management Systems** - Improve surveillance and data management systems.

Actions:

1. Develop consensus on a set of uniform indicators to assess the burden of diabetes in Missouri.
2. Assess the availability of morbidity and outcome data, other than BRFSS.
3. Develop systems among partners to share utilization data.
4. Work to reduce barriers to data sharing among organizations with pre-diabetes and diabetes data.
5. Assess the feasibility of making diabetes a mandated reportable condition by health care providers.

Strategy 2: **Distribution** - Increase analysis, utilization, and dissemination of data.

Actions:

1. Expand technical assistance and support for data analysis and utilization by internal and external partners.
2. Develop/identify a network to distribute data proactively.
3. Increase access to diabetes-related analysis and record use of information by policy makers, partners, health professionals and the public for informed program planning and policy development.

Strategy 3: **Evaluation** - Enhance evaluation for program and system improvement to increase prevention, management and early detection of diabetes.

Actions:

1. Develop tools for standardized measures for diabetes program evaluation (including process, impact, outcomes).
2. Explore mechanisms for development of additional resources (staff and funding) for evaluation.
3. Enhance training in conducting evaluation.
4. Develop or select standard methods for specific evaluation needs including: coalition effectiveness, reach and effectiveness of media campaigns, and evaluation of policy initiatives.

IMPLEMENTATION & EVALUATION

Implementation and Evaluation

In order to accomplish the actions stated in the Strategic Plan, a work plan will be developed based on identified priorities, feasibility, and impact. The work plans will identify detailed steps, time frames, organizational responsibilities, and who will be responsible for assuring completion of the work. The evaluation of the plan will build capacity for data analysis of short-term, intermediate and long-term outcomes.

The implementation and evaluation plan will be reviewed semiannually to determine progress and modify work as necessary. Progress in accomplishing the actions will be tracked annually, at a minimum, through designated mechanisms or surveillance systems. The Missouri Diabetes Prevention and Control Program (MDPCP) staff will determine the updates needed in the implementation and evaluation plan with input from key partners.

The Missouri Diabetes Prevention and Control Program Advisory Board will be provided with annual progress updates and the difficulties encountered in implementing the Strategic Plan. The advisory board will consult on any revisions to the Strategic Plan on an annual basis. At a minimum, a strategic planning process will be conducted during the Strategic Plan's fifth year to determine if course redirections are needed to achieve results.

Federal, State and Local Support

Support from partners and state and local officials is critical to the implementation of the Strategic Plan. The implementation and evaluation plan will detail the resources available to support the Strategic Plan. Funding, in addition to that provided by the CDC, is critical to support diabetes prevention and control efforts. It is anticipated that key partners will direct additional funds into critical projects to support the implementation of the Strategic Plan. Funding from other state, federal and private sources, such as foundations, will be sought by MDPCP and key partners. Support for disseminating key messages to influence lifestyle modifications by Missouri residents will be requested from various media groups.

Key decision makers in the state legislature, state and local health administrations, and partners will need to identify and implement policies and direct resources to improve behaviors and practices for the prevention, early detection, and improved management of diabetes. This will require an ongoing evaluation of efforts and fine-tuning of interventions to ensure they continue to impact the targeted population as society's knowledge, attitudes, behaviors and norms change.

Endnotes

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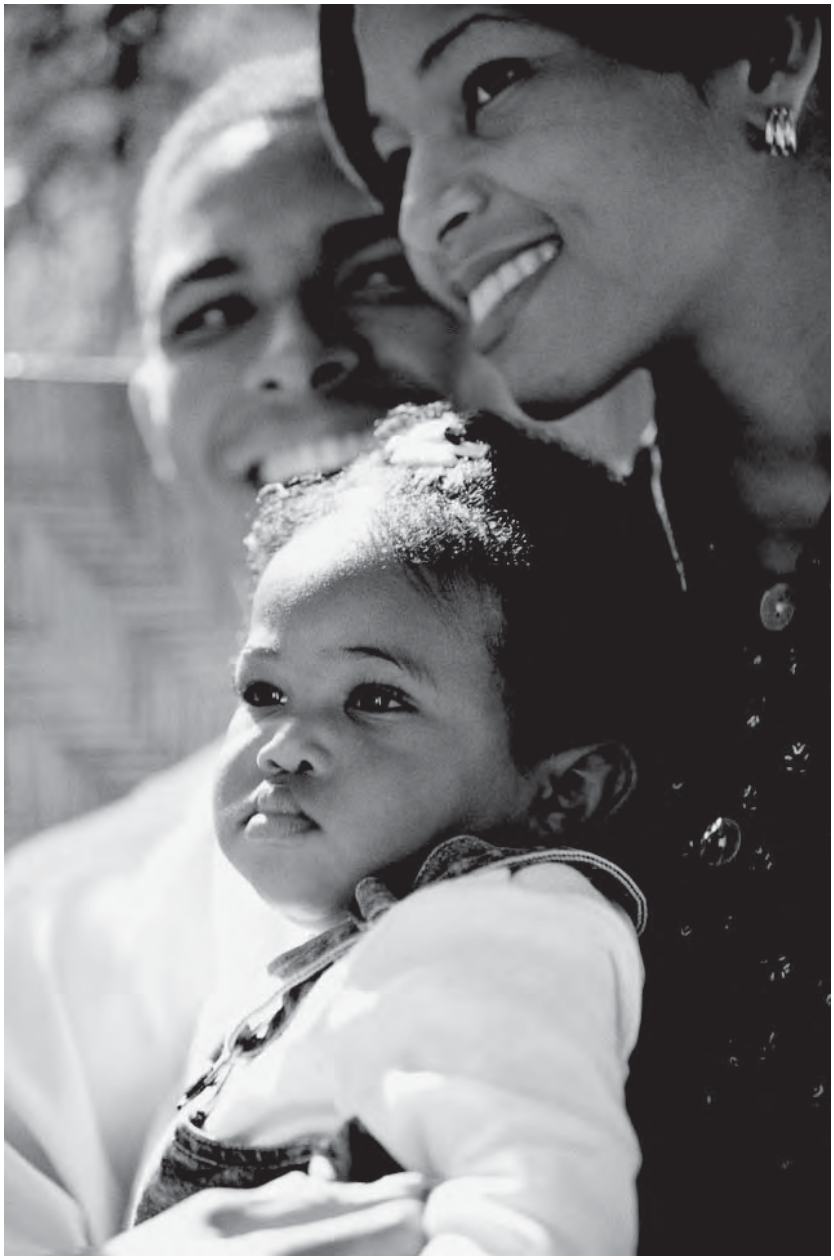
APPENDICES



APPENDIX A

Glossary of Terms

Theses terms were defined using a variety of sources including the Wisconsin State Plan and the American Diabetes Association.

A1C (hemoglobin A1C or HbA1C): The test for A1C indicates how well you have controlled your diabetes over the last few months. Even though you may have some very high or very low blood glucose values, A1C will give you a picture of the average amount of glucose in your blood over that time period. The result can help you and your doctor know if the measures you are taking to control your diabetes are successful.

acanthosis nigricans: A skin condition characterized by darkened skin patches and common in people whose body is not responding correctly to the insulin that they make in their pancreas (insulin resistance). This skin condition is also seen in people who have pre-diabetes or type 2 diabetes.

adjusted incidence rate: The rate of development of a disease in a group over a certain time period.

adult: Individual 18 years of age or older.

autoimmune disease: Disorder of the body's immune system in which the immune system mistakenly attacks and destroys body tissue that it believes to be foreign.

Behavioral Risk Factor Surveillance System (BRFSS): The BRFSS is a cross-sectional telephone survey conducted by state health departments with technical and methodological assistance provided by the Centers for Disease Control and Prevention. The surveys generate information about health risk behaviors, clinical preventive practices, and health care access and use primarily related to chronic diseases and injury.

blood glucose: The main sugar that the body makes from food we eat. Glucose is carried through the bloodstream to provide energy to all of the body's living cells. The cells cannot use glucose without the help of insulin.

blood pressure: The force of the blood against the artery walls. Two levels of blood pressure are measured: the highest, or systolic, occurs when the heart pumps blood into the blood vessels, and the lowest, or diastolic, occurs when the heart rests.

body mass index (BMI): A formula that uses weight and height to estimate body fat. It is one factor used in determining if a person is at risk for health problems that are impacted by body stature and to gauge health risks due to carrying too much weight. The BMI is only one factor in determining a person's health risk.

carbohydrates: One of the three main nutrients in food. Foods that provide carbohydrates are starches, vegetables, fruits, dairy products and sugars.

cardiovascular disease: A disease of the heart and blood vessels (arteries, veins and capillaries).

cholesterol: A type of fat produced by the liver and found in the blood; it is also found in some foods. Cholesterol is used by the body to make hormones and build cell walls.

complication: Conditions that can result from poorly controlled diabetes. Complications can also be considered secondary health problems. Some examples include eye and dental disease, foot problems, and heart and kidney disease. Fortunately, most complications can be effectively delayed, prevented or controlled.

comprehensive dental exam: A complete dental exam includes head and neck palpation, masticatory muscle evaluation, dental symptom assessment, visual examination for hard and soft tissue anomalies, review of recent/current dental x-rays, and complete periodontal assessment to include periodontal pocket charting.

comprehensive foot exam: The comprehensive foot examination can be accomplished in a primary care setting and should include the use of a monofilament, tuning fork, palpation, and a visual examination. This examination should include assessment of protective sensation, foot structure and biomechanics, vascular status, and skin integrity. Evaluation of neurological status should include a quantitative somatosensory threshold test, using the Semmes-Weinstein 5.07 (10-g) monofilament.

confidence interval: Unlike enumeration, sampling introduces uncertainty to an estimate of the true total or true mean. A confidence interval is the plausible range for the true value, computed from the sample data and has a given probability that the unknown true value is located within the interval.

contributing cause of death: Missouri deaths for which the disease was a significant condition contributing to the death but not resulting from the underlying cause. For death certificate data collected through 1998, the International Classification of Diseases (ICD-9) code 250 was used; for data years 1999 forward, the International Classification of Diseases (ICD-10) codes E10-E14 were used.

current smoker: An individual who smokes every day or smokes some days.

diabetes: The short name for the disease called diabetes mellitus. Diabetes results when the body cannot use blood glucose as energy because of having too little insulin or being unable to use insulin properly. (See also: gestational diabetes, pre-diabetes, type 1 diabetes, type 2 diabetes.)

diabetes educator: A health care professional who teaches people with diabetes how to manage their disease (some diabetes educators are certified diabetes educators: professionals with expertise in diabetes education who have passed a certification exam). Diabetes educators work in hospitals, physician offices, managed care organizations, home health care services and other settings.

diabetes stakeholders: Individuals representing state government agencies other than the Missouri Department of Health and Senior Services, private enterprises, and voluntary organizations that provide essential services to the health of the public with, and at risk for, diabetes.

dilated eye exam: A specific eye exam that includes dilating of the pupil of the eye so that the retina (the back of the eye) can be carefully examined. This type of exam is crucial for people with diabetes.

dyslipidemia: Disorders in the lipoprotein metabolism; classified as high cholesterol, high triglycerides, combined hyperlipidemia, and low levels of high-density lipoprotein (HDL) cholesterol. All of the dyslipidemias can be primary or secondary. Both elevated levels of low density lipoprotein (LDL) cholesterol and low levels of HDL cholesterol predispose one to premature atherosclerosis.

early detection: The process to identify a disease or health condition before there is significant damage caused to an individual's health status.

end-stage renal disease: The point when the kidneys are so badly damaged or scarred that they fail; either renal dialysis or kidney transplantation is then required.

gestational diabetes: A type of diabetes that can occur in pregnant women who have not previously been known to have diabetes. Although gestational diabetes usually subsides after pregnancy, many women who have had gestational diabetes develop type 2 diabetes later.

glucose: A simple sugar; the body's primary source of energy.

health systems: Organizations that contribute to diabetes care, services and programs.

Healthy Missourians Initiative: Missouri's plan to address the state's obesity epidemic and to encourage healthy lifestyles for Missourians of all ages.

Healthy People 2010: The prevention agenda for the nation. It is a statement of the national health objectives designed to identify the most significant preventable threats to health and to establish national goals to reduce these threats. It can be used by many different people, states, communities, professional organizations and others to help develop programs to improve health. The Healthy People 2010 health objectives can be found at http://www.healthypeople.gov/Document/HTML/Volume1/05Diabetes.htm.

high-density lipoprotein (HDL): A form of cholesterol that circulates in the blood. Commonly called "good" cholesterol. High HDL lowers the risk of heart disease. An HDL of 60 mg/dl or greater is considered high and protects against heart disease. An HDL less than 40 mg/dL is considered low and increases the risk for developing heart disease.

hypertension: A condition present when blood flows through the blood vessels with a force greater than normal. Also called high blood pressure. Hypertension can strain the heart, damage blood vessels, and increase the risk of heart attack, stroke, kidney problems and death.

impaired fasting glucose (IFG): A condition in which a blood glucose test, taken after an 8- to 12-hour fast, shows a level of glucose higher than normal but not high enough for a diagnosis of diabetes. IFG, also called pre-diabetes, is a level of 100 mg/dL to 125 mg/dL. Most people with pre-diabetes are at increased risk for developing type 2 diabetes.

impaired glucose tolerance (IGT): A condition in which blood glucose levels are higher than normal but are not high enough for a diagnosis of diabetes. IGT, also called pre-diabetes, is a level of 140 mg/dL to 199 mg/dL two hours after the start of an oral glucose tolerance test. Most people with pre-diabetes are at increased risk for developing type 2 diabetes. Other names for IGT that are no longer used are "borderline," "subclinical," "chemical," or "latent" diabetes.

incidence: How often a disease occurs; the number of new cases of a disease among a certain group of people over a specific period of time (e.g., one year).

insulin: A hormone that helps the body use blood glucose for energy. The beta cells of the pancreas make insulin.

insulin-dependent diabetes: See type 1 diabetes.

insulin-resistance: The body's inability to respond to and use the insulin it produces. Insulin resistance may be linked to obesity, hypertension and high levels of fat in the blood.

lifestyle modifications: An individual's lifestyle choices that may affect his/her risk for diabetes or its complications. This includes things such as physical activity, eating habits and tobacco use.

macrovascular disease: A disease of the large blood vessels, such as those found in the heart. Lipids and blood clots build up in the large blood vessels and can cause atherosclerosis, coronary heart disease, stroke and peripheral vascular disease.

medical nutrition therapy (MNT): MNT involves the assessment of the nutritional status of patients with a condition, illness or injury that puts them at risk. This includes review and analysis of medical and diet history, laboratory values, and anthropometric measurements. Based on the assessment, nutrition modalities most appropriate to manage the condition or treat the illness or injury are chosen.

microalbuminuria: Small amounts of the protein called albumin in the urine detectable with a special lab test.

Missouri Diabetes Prevention and Control Program: Statewide program located in the Missouri Department of Health and Senior Services, Bureau of Cancer and Chronic Disease Control. The program is dedicated to improving the health of people at risk for, or with, diabetes.

Missouri Diabetes Public Health System: The state public health agency, including the Missouri Diabetes Prevention and Control Program, working in partnership with other statewide government agencies, private enterprises, and voluntary organizations to provide services essential to the health of the public with, and at risk for, diabetes.

non-insulin dependent diabetes: See type 2 diabetes.

obesity: An excessively high amount of body fat of adipose tissue in relation to lean body mass. Individuals with a body mass index of 30.0 kg/m^2 or greater are considered obese.

oral glucose tolerance test (OGTT): A test to diagnose pre-diabetes and diabetes. The oral glucose tolerance test is given by a health care professional after an overnight fast. A blood sample is taken, then the patient drinks a high-glucose beverage. Blood samples are taken at intervals for two to three hours. Test results are compared with a standard and show how the body uses glucose over time.

overweight: Increased body weight in relation to some standard of acceptable or desirable weight. Individuals with a body mass index of 25.0 kg/m^2 to 29.9 kg/m^2 are considered overweight. In most cases, persons who are obese are also considered overweight.

polycystic ovarian syndrome (PCOS): An accumulation of many incompletely developed follicles in the ovaries. This condition is characterized by irregular menstrual cycles, scanty or absent menses, multiple small cysts on the ovaries (polycystic ovaries), mild hirsutism (excessive hair), and infertility. Many women who have this condition also have diabetes with insulin resistance. Also known as Stein-Leventhal Syndrome.

pre-diabetes: A condition when blood glucose levels are higher than normal but are not yet high enough to be diagnosed as type 2 diabetes.

prevalence: The number of people in a given group or population who are reported to have a specific disease at any one point in time.

principal diagnosis: As defined by the Uniform Hospital Discharge Data Set, the principal diagnosis represents the "condition established after study to be chiefly responsible for occasioning the admission of the patient to the hospital for care."

retinopathy: A diabetic eye disease that damages the small blood vessels in the retina. Loss of vision may result.

risk factor: A trait that increases the chance that a person will get an illness or disease.

self-management: Day-to-day activities undertaken by an individual to control and monitor their diabetes outside of the clinical setting.

self-monitoring of blood glucose (SMBG): A person with diabetes using a meter to test their blood glucose level; also called home blood glucose monitoring.

strategy: A series of planned and sequenced tasks to achieve a goal. Strategies must be clearly stated and observable.

surveillance: The ongoing and systematic collection, analysis and distribution of information. Surveillance methods detect changes in trends or distribution to initiate investigative or control measurers.

triglycerides: The storage form of fat in the body. High triglyceride levels may occur when diabetes is out of control.

type 1 diabetes: A condition in which the pancreas makes so little insulin that the body cannot use blood glucose as energy. Type 1 diabetes most often occurs in people younger than age 30 and must be controlled with daily insulin injections. Also known as insulin-dependent diabetes.

type 2 diabetes: A condition in which the body either makes too little insulin or cannot use the insulin it makes in order to turn blood glucose into energy. Type 2 diabetes can often be controlled through meal plans and physical activity. Some people with type 2 diabetes have to take diabetes pills or insulin. Also know as non-insulin dependent diabetes.

underlying cause of death: Missouri deaths for which the disease was the underlying cause of death. For death certificate data collected through 1998, the International Classification of Diseases (ICD-9) code 250 was used; for data years 1999 forward, the International Classification of Diseases (ICD-10) codes E10-E14 were used.

APPENDIX B

Acronyms

A1C ..... Glycated hemoglobin test

BGHC ..... Bureau of Genetics and Healthy Childhood

BRFSS ..... Behavioral Risk Factor Surveillance System

DHSS ..... Missouri Department of Health and Senior Services

HDL ..... High-density lipoprotein

IFG ..... Impaired fasting glucose

IGT ..... Impaired glucose tolerance

MDPCP ..... Missouri Diabetes Prevention and Control Program

MICA ..... Missouri Information for Community Assessment

OGTT ..... Oral glucose tolerance test

PAS ..... Patient Abstract System

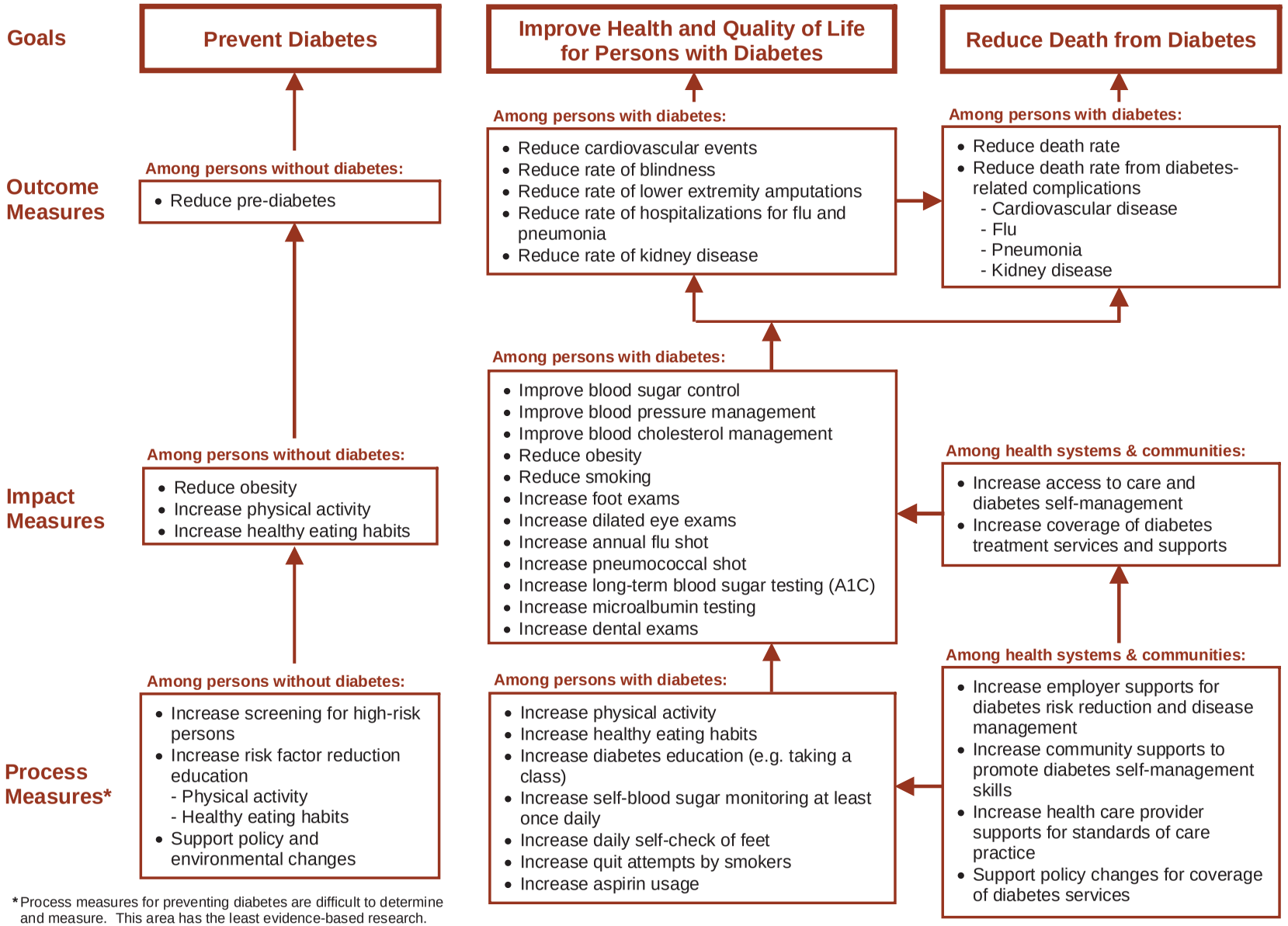
PCOS ..... Polycystic ovary syndrome

YTS ..... Youth Tobacco Survey

Diabetes Logic Model

Preventing, Detecting and Controlling Diabetes: Missouri's State Plan Goals and Measures

Overarching Goal: To improve the health of persons in all populations with and at risk for diabetes.



*Process measures for preventing diabetes are difficult to determine and measure. This area has the least evidence-based research.

8/2005

APPENDIX C

APPENDIX D

Missouri Diabetes Strategic Planning Work Group

(List of work group members, June 2005.)

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- Deborah Cooper, Missouri Foundation for Health
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APPENDIX D

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- Paula Nickelson, Prevention Services Coordinator, DHSS
- Nancy Rebecca Palmer, RN, University Hospital & Clinics
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- Rita Reeder, MS, RD, LD, WISEWOMAN Program, DHSS
- Travis Rickford, BA, MPA, Missouri Diabetes Prevention and Control Program, DHSS
- Keith Roderick, Rehabilitation Services for the Blind, Missouri Department of Social Services (DSS)
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- Robert Whitlock, Missouri Kidney Program
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